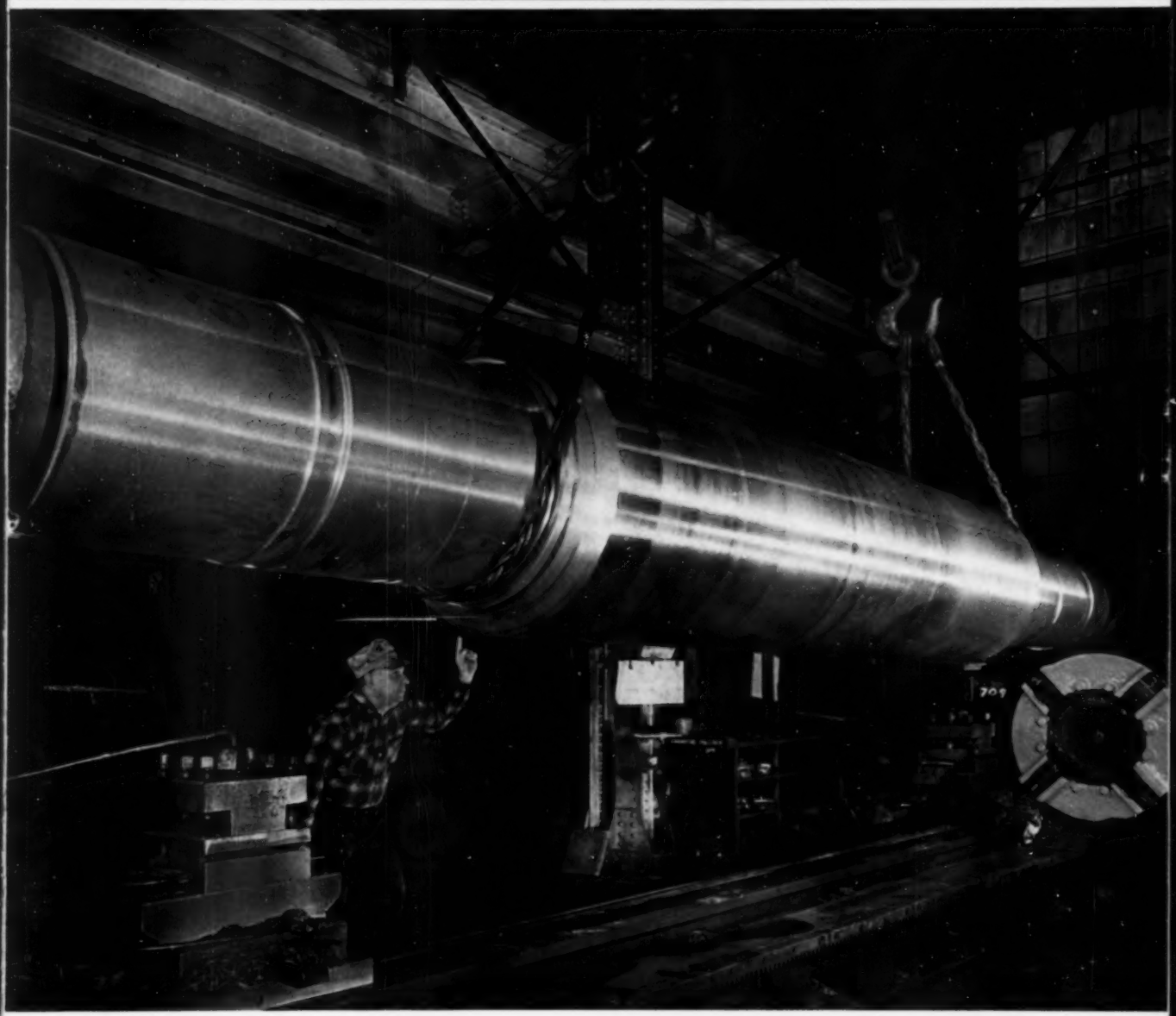
American Machinist

JUNE 30, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Adhesive Bonding

A SPECIAL REPORT
Page 85



Loading a 66,000-lb cast-iron roll—see page 2

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it's mainly a matter of TIMING!

WHEN to replace a machine can mean the difference between profit and loss

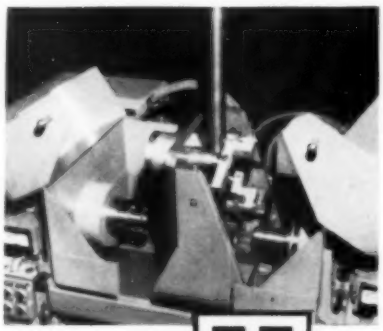
TOO EARLY is just as bad as too late. But somewhere in between there's a mathematically determinable *right time* to retire that old machine and replace it with a new one. A time when this replacement works out to your best advantage from the standpoint of production cost and capital investment.

Guess-work, intuition or rule-of-thumb computations usually come up with the wrong answer. And even carefully conceived "obsolesence formulas" may have their pitfalls. Because incorrect replacement timing, one way or the other, can *waste* thousands of dollars, this problem is of vital concern to all industry.

But Heald can help you solve it. Our sales engineers are well experienced in precise methods of replacement analysis. If you're in doubt, or would like to check your own computations, call in your Heald engineer. He will be glad to help you determine the right time to replace. And if now is too soon, he will tell you so. Similar cost studies by Heald engineers have pointed the way to many substantial savings.

For example: This new Heald Model 322 Bore-Matic replaced a heavy-duty drill for boring and chamfering hydraulic-cylinder piston rods. A cost analysis determined that the investment in a new machine could not be deferred any longer without serious financial loss. As verified by subsequent operation, the new machine offered the following savings:

	Old Machine	New Machine
Parts per hour	11	24
Machine load, per year	3,080 hrs.	1,380 hrs.
Direct & Indirect Labor	9,480 hrs.	3,240 hrs.
Annual Maintenance	$356	$100
Annual Operating Cost	$27,800	$15,000
Annual Saving, New Machine		$12,800
Net Return on Investment		39.6%



YOU pay for obsolesence. Replacement pays for itself!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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Alco interchanges pre-tooled lathes . . . and eliminates downtime for retooling. *By John K Grusdis, Alco Products, Inc.* 102

SPECIAL REPORT NO. 461

The Production Engineer's Guide to Adhesive Bonding Methods . . . When should you choose adhesive assembly? Which adhesive should you select? What handling procedure should be chosen? Here are comprehensive answers to these questions. *By John P Wright.* 85

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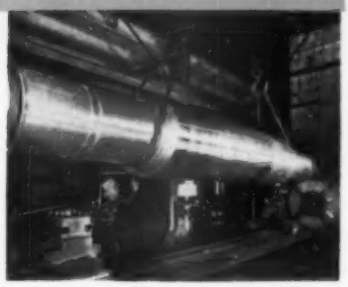
American Machinist chips



Adhesive Bonding... Associate Editor John Wright has undertaken a basic primer on the types of materials used for adhesive bonding and on how to apply them. This is a broad-gage approach in our "Production Man's Guide" series of Special Reports. You will find much of value here if you contemplate trying adhesive bonding. It includes a discussion of the factors involved in selecting an adhesive and information on the types of adhesives that are available to meet these requirements.

Loading Methods... When we undertook a report on loading methods for machine tools in our Tool Show Issue last spring we unleashed a tiger. Rupert Le Grand, our senior associate editor, began collecting material and by the time he had finished, there was hardly room for the portly Rupert in his office. Only three types of loaders could be squeezed into that crowded issue. This week Rupert emerges with Part 4 on magazine and chute feeds (page 77) and the promise of more to come.

To Buy or Not To Buy... That is the question. Whether 'tis better to use baling wire on the ancient and honorable wreck or to invest in the sleek, high-production '58 model. Formulas for calculating the advisibility abound. But there may be many reasons why it is sound to change (or not to) that can't show up in existing formulas. We've been on the lookout for examples of these unusual reasons. The effect of replacement on Inventory was shown in the DeVlieg case (*AM*—Apr 7 '58, p 90). This week we have another unusual approach, this time on the machine capability and what it can do to a host of other costs not directly related to the machine itself, yet dependent on it. See page 80.

Downtime for retooling is eliminated by pre-tooling lathes and then in e.ting them in the line. Alco does it. See page 102.

Coming... *AM* for July 14 promises an interesting story on tooling for cold extrusion, on the testing of an intercontinental missile (the tests production men make, not those at Cape Canaveral), some tooling ideas for tube bending, an interesting cost-cutter for assembly, and advice on getting the most out of adjustable speed drives.

Cover...

66,000 pounds of mill roll is swung into the air at the Pittsburgh plant of Macintosh, Hemphill Div, E W Bliss Co. These high-nickel alloy rolls are among the largest CI rolls made for the steel industry.

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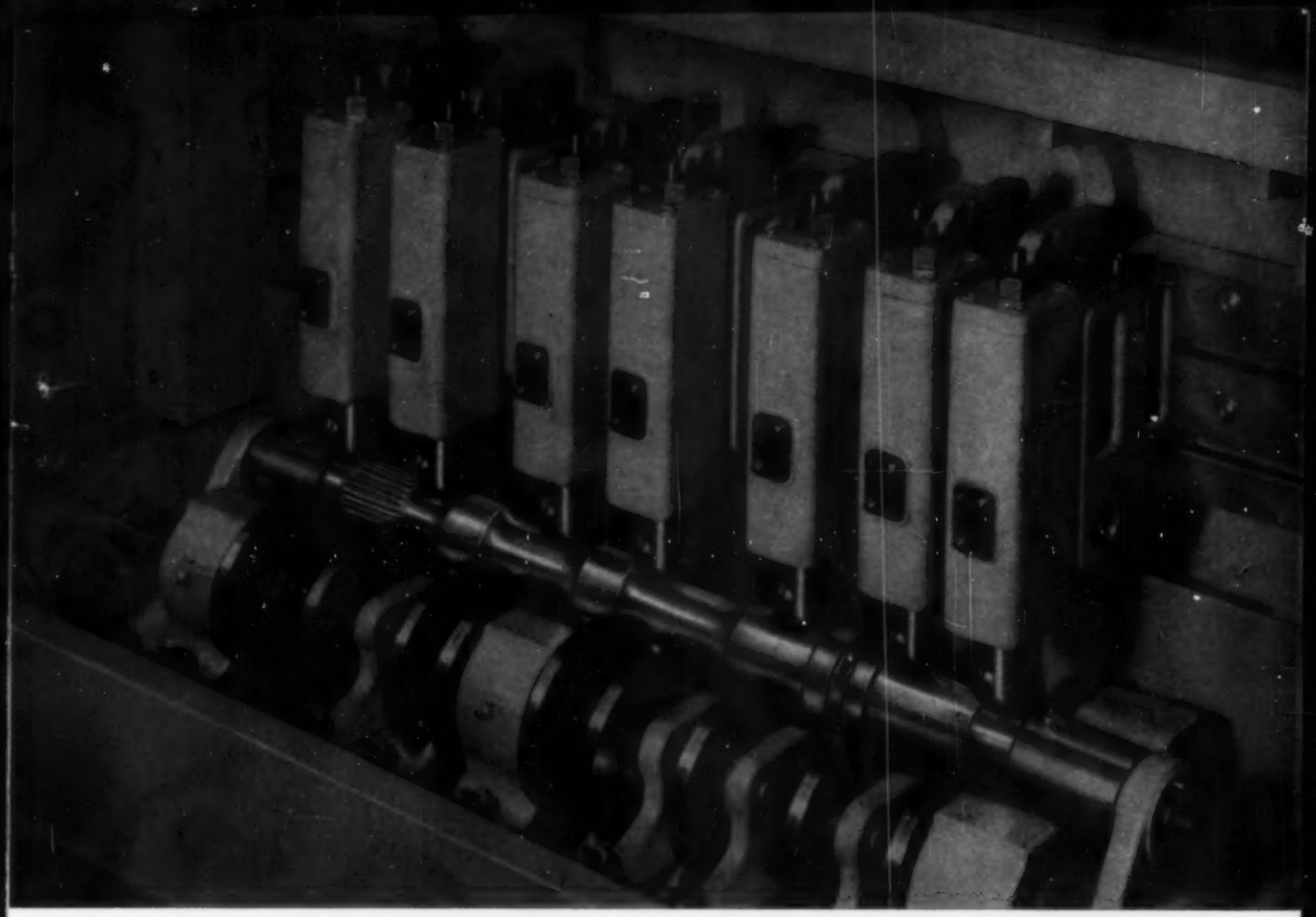


How to eliminate *your* shaft distortion problems

Distortion during hardening is a major production problem.

The Gleason No. 140 Rolling Quench Machine corrects this difficulty, because the quenching and straightening operations are performed at the same time. Because cold straightening is eliminated, valuable production time and expense are saved, and the quenched parts have less residual stress.

Shafts cannot distort because they are rolled under pressure throughout the quenching operation. The operator puts the hot part on the lower rollers and starts the machine. From there on, the quenching operation is automatic. Rolling speed, pressure, and oil flow are pre-set to suit the work that is being quenched.

The automatic quenching cycle saves operator time, and gives *uniform* results for all parts quenched. The pre-set metallurgically correct oil flow gives uniform hardness.

The Gleason No. 140 Rolling Quench Machine is equally suited for small or large quantities. It accommodates shafts $\frac{9}{16}$" to 4" in diameter, 6" to 40" in length, with integral cams or shoulders up to 8" diameter. Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling. Write for further information.

The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

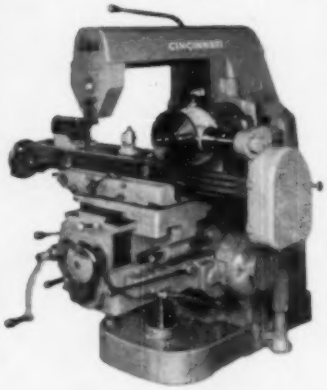
Variety plus

Cincinnati MIs are tops for practically every

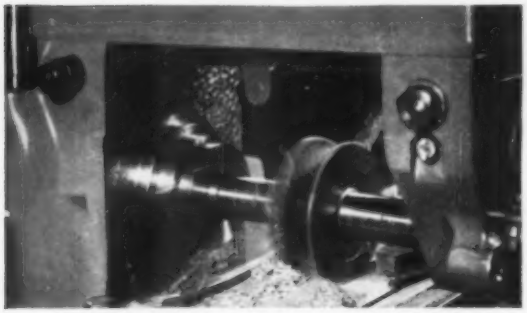
Down milling holds thin parts down against the table or fixture; reduces in-process breakage of frail parts. Down milling is one of the many operations you can assign to CINCINNATI ML and MI Milling Machines, for all of them are equipped with Cincinnati's exclusive built-in backlash eliminator. While the table is feeding the work under or across the cutter this device automatically eliminates the backlash between the feed screw and nut; it automatically releases for all other conditions of table movement and adjustment. Other standard MI features to help you do a better job of variety toolroom milling include:

16 spindle speeds, 25 to 1500 rpm. 16 feeds, ¼ to 30 ipm. Live power rapid traverse, 150 ipm. Single crank selection of spindle speeds and feeds. Dynapoise overarm smooths out the cutting action. Hand cranks automatically disengage; no spinning. Big selection of standard attachments.

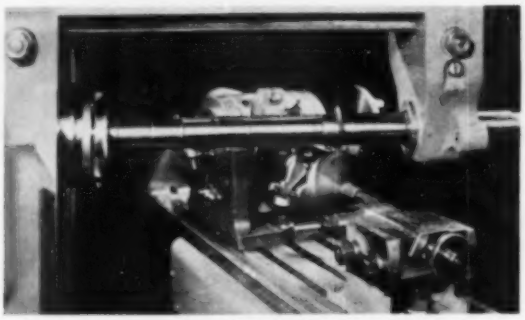
These and other Cincinnati advantages give CINCINNATI MLs and MIs top billing for 3 hp to 7½ hp milling operations. Get complete information by writing for a copy of catalog No. M-1995. Brief data will be found in Sweet's Machine Tool File.



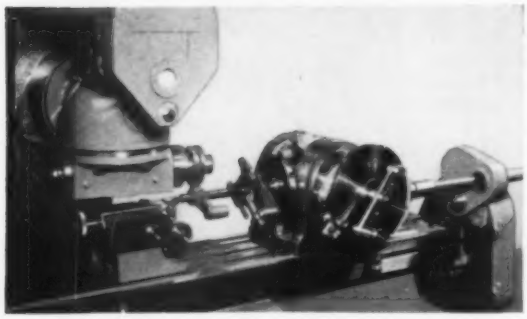
CINCINNATI No. 2 MI Universal Milling Machine. Catalog No. M-1995.



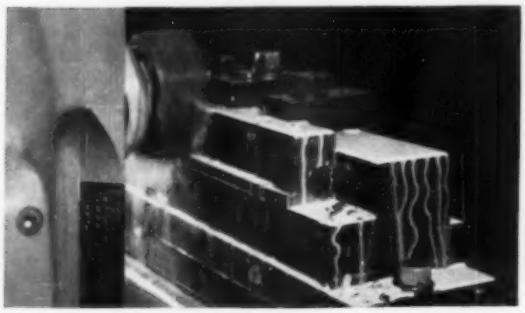
Aluminum and other non-ferrous metals requiring high cutting speeds can be efficiently milled on the MIs.



Helical gears up to 45° helix can be milled on MI Universals with no extra equipment.



Milling a helical tooth on the business end of a cast iron lever. The Universal Spiral Milling Attachment and Dividing Head are employed for this operation.



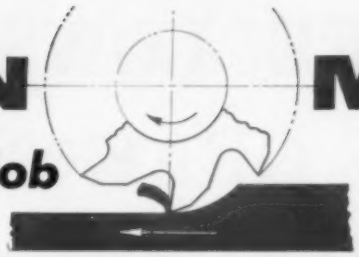
Taking a heavy cut in a steel vise jaw. CINCINNATI MI Milling Machines are constructed to assure the use of full motor hp at the cutter.

CINCINNATI®

MILLING MACHINES • BROACHING MACHINES • CUTTER METAL FORMING MACHINES • HARDENING MACHINES •

. . . DOWN MILLING

toolroom milling job



Down milling a thin part clamped to the machine table. As the cut progresses, the clamp on the exit end of the work is removed. Automatic Backlash Eliminator, an exclusive Cincinnati feature, makes down milling a routine operation.

CINCINNATI

AND TOOL GRINDERS • SPECIAL MACHINE TOOLS
CUTTING FLUIDS • GRINDING WHEELS

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

FELLOWS 36-TYPE GEAR SHAPERS cut at CINTI

Foreground: one of three 36-Type Gear Shapers cutting a large internal gear for a major road equipment manufacturer.

THE PRECISION LINE

Production Costs

CINCINNATI GEAR

One of the leading custom gear manufacturers in the country, The Cincinnati Gear Company, relies on the most modern equipment in every department to maintain their reputation for producing high quality gears. Outstanding breadwinners, in a shop familiar with every type of gear production machine, are their Fellows 36-Type Gear Shapers.

Fellows "36-Type" is fast and simple to set up, whether for 10 or 100 gears, for internal or external spurs, helicals, and herringbones up to 36" P.D. and 6" face width. Thanks to its rugged design and construction, it holds close tolerances even while taking extra heavy cuts at cutting speeds ranging from 18 to 300 strokes per minute. Its versatility makes it possible to cut cams, splines, and special contours, too.

For full information about the Fellows 36-Type Gear Shaper and its production advantages, get in touch with your Fellows representative. Ask him, too, about the Fellows Plans for deferred payment. Just call any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
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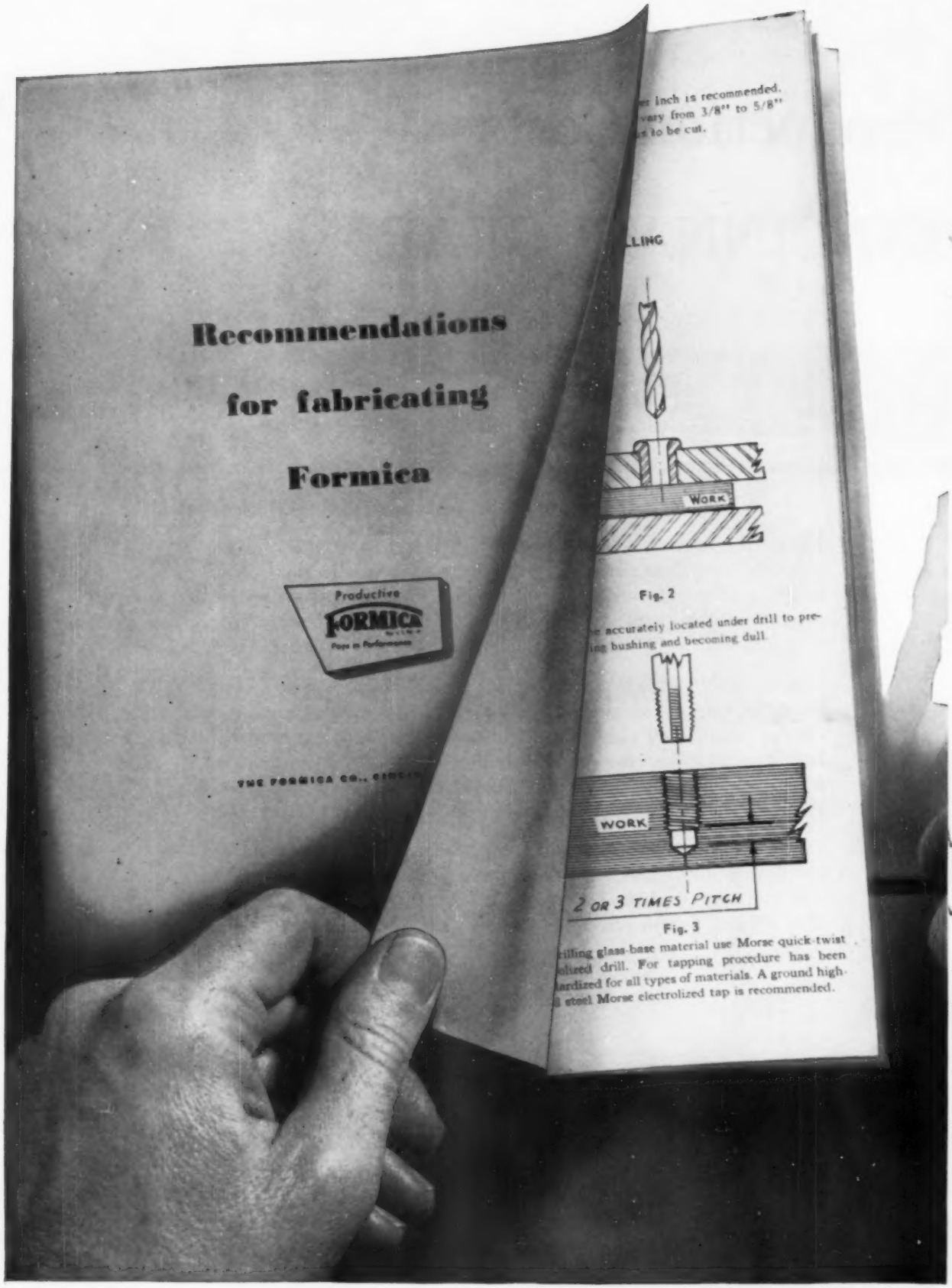
Fellows *Gear Production Equipment*


Recommendations
for fabricating
Formica
Productive
FORMICA
Pace in Performance
THE FORMICA CO.
inch is recommended.
vary from 3/8" to 5/8"
to be cut.
LLING
WORK
Fig. 2
accurately located under drill to pre-
ing bushing and becoming dull.
WORK
2 OR 3 TIMES PITCH
Fig. 3
illing glass-base material use Morse quick-twist
olized drill. For tapping procedure has been
ardized for all types of materials. A ground high-
steel Morse electrolized tap is recommended.

Why FORMICA says:

Reg. U. S. Pat. Off.

"Use MORSE Electrolized Tools!"

Top performance on the job, hole after hole after hole . . . that's why the instruction manual of the Formica Corporation specifies:

"*For Drilling Glass-Base Material:*
MORSE Quick-Twist *Electrolized* Drill . . .

"*For Drilling Paper and Fabric-Base Materials:*
MORSE Slow-Spiral *Electrolized* Bakelite Drill . . .

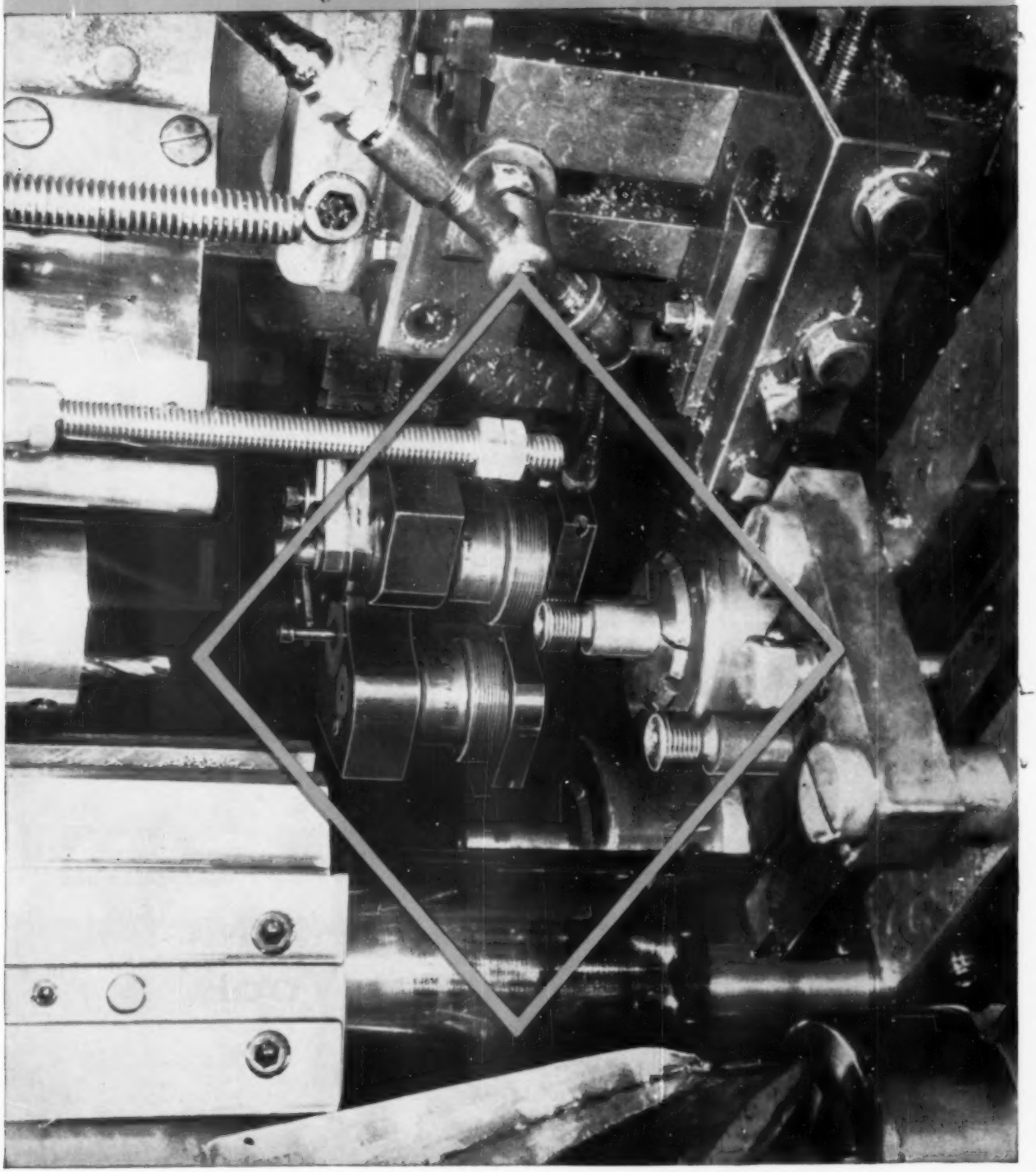
"*For Tapping:*
Procedure has been standardized for all types of materials. A ground High-Speed Steel MORSE *Electrolized* Tap is recommended."

Formica, like every other concern that has tested it, finds that the exclusive MORSE process of *Electrolizing* gives up to 30% longer tool life on the toughest jobs. And the only source for *Electrolized* cutting tools is the Morse-Franchised Distributor.

MORSE TWIST DRILL & MACHINE COMPANY • NEW BEDFORD, MASS.
Subsidiary of VAN NORMAN INDUSTRIES, INC.
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

MORSE means "THE MOST" in Cutting Tools

1/2" taper pipe thread



rolled with the LANROLL attachment

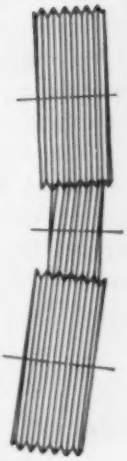
The recently developed LANDIS Method for precision rolling of taper pipe threads is shown at the Mac-It Parts Company, Lancaster, Pennsylvania, in the production of pipe plugs.

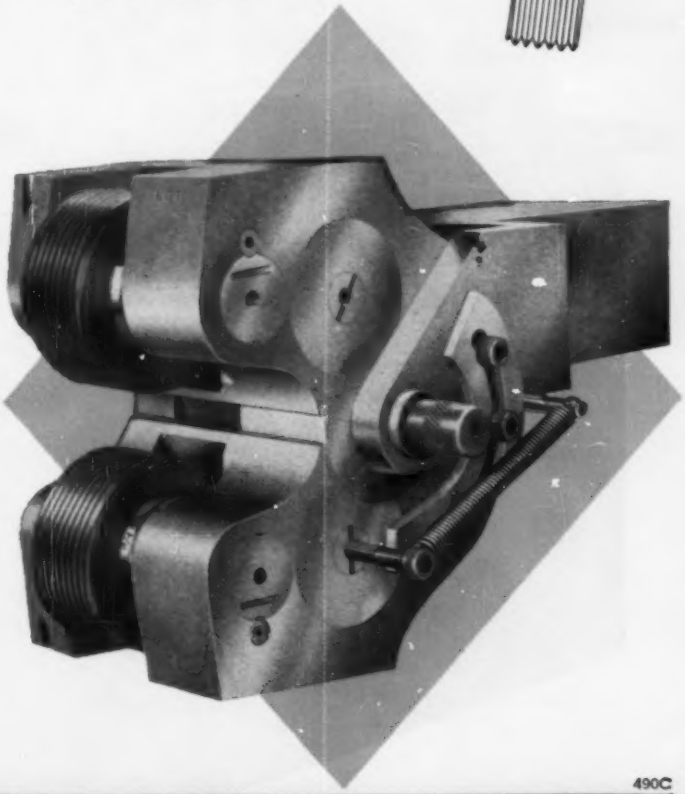
1/2" 14 pitch American Standard Taper Pipe threads are being rolled 9/16" long to dry seal specifications on 4140 steel (207 Brinnell). The #22GA LANROLL Attachment (with a pipe range of 1/8" to 1") is used in the third position on a National Acme Bar Automatic —45,000 pieces are threaded with each set of rolls.

To produce the taper, the rolls of the LANROLL Attachment are supported on carbide shafts inclined to the required thread taper. This design enables the use of parallel rolls (see diagram) which reduces slippage between the workpiece and rolls. With reduced slippage, roll life is materially increased. In addition, attachment stabilization (limited sidewise movement) is greatly improved to permit rolling directly to a shoulder with safety.

A highly desirable design feature of the LANROLL Attachment is the ability to remove the attachment from the shank by simply withdrawing the shank pin. By this means, machine tooling changes or attachment servicing can be accomplished without disturbing the original set up. This same construction facilitates, through the use of a gage, a precision, safe means for locating the attachment on the tool slide in respect to the high point of the machine's feed cam. Also, it allows attachment tipping to avoid indexing interference on screw machines having a limited tool slide movement. The same LANROLL Attachment will produce either straight or taper threads by using the proper rolls and an important but limited amount of auxiliary equipment. They provide wide range coverage while retaining the rigidity of a non-adjustable tool—assuring operation for every size within its range as though it were exclusively engineered for the particular work being threaded.

For complete information on the LANDIS Method of rolling taper threads and other outstanding design principles, please write and request Bulletin G-96.





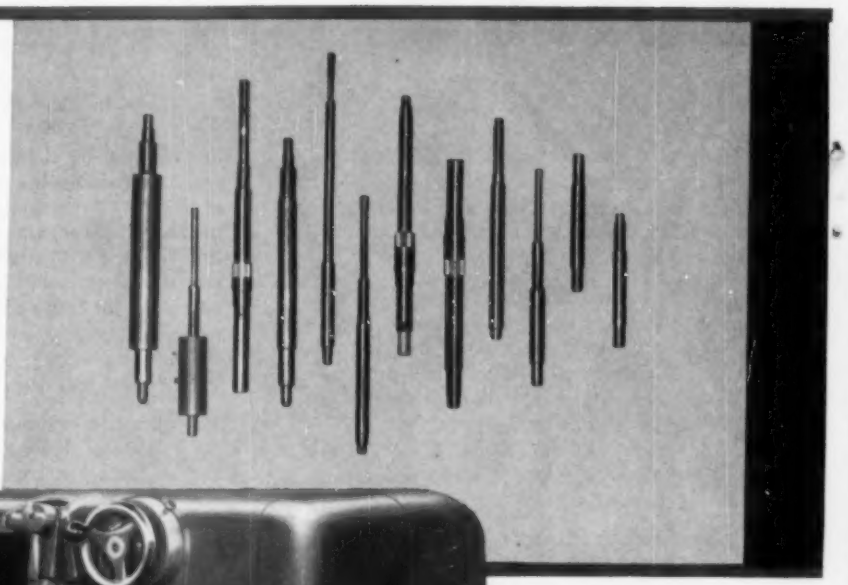
490C

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

Accuracy and speed of Landis plain grinders

Since the addition of two Landis 4" Plain Grinders in the grinding department of a midwestern electric company, overall grinding costs on motor shafts have shown an appreciable drop. Production has been stepped up and at the same time rejects have been substantially reduced. Close tolerances of .0002" are easily maintained with finishes meeting all requirements consistently.



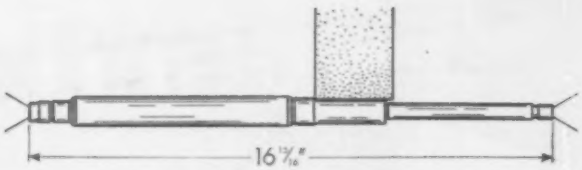
Landis 4" x 18" type H plain hydraulic grinder

LANDIS TOOL COMPANY

cut unit costs in grinding motor shafts

Profitable production. Fast change of setup on the new Landis Grinders means more production time. Twelve electric motor shafts of varying diameters are ground in this department.

Close tolerances. Accuracy to "tenths" consistently maintained on infeed and traverse grinding operations.

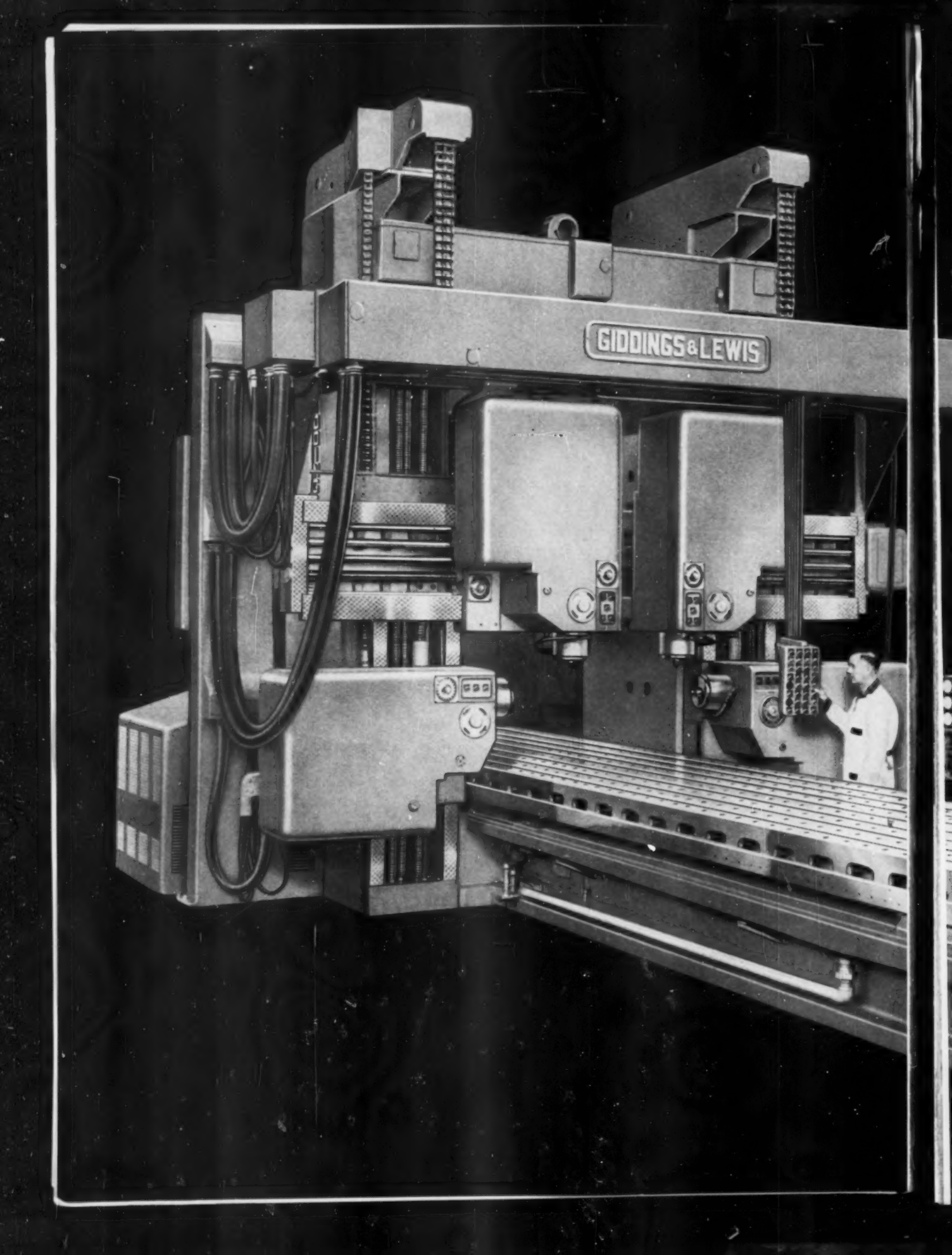


production data

Operation:	Infeed and traverse grinding diameters of motor shafts
Machines:	Landis 4" type H plain grinders
Production:	From 70 to 140 parts per hour depending on size
Material:	1117 cold rolled steel and free machining stainless steel type 416
Stock removal:	.012" to .015", finishing
Finish:	16 to 30 RMS
Tolerance:	Range from .0002" to .0005" on diameter depending on the shaft being ground

WAYNESBORO, PENNSYLVANIA

LANDIS
precision grinders


GIDDINGS & LEWIS

Giddings & Lewis high-speed 10-inch quill HYPRO PLANER-MILLERS

You get *power* plus *ultra-precision* milling with four 50-hp water-cooled head motors . . . *proven design* features . . . *advanced engineering* in the revolutionary G&L 10-inch quill HYPRO planer-type milling machine. Outstanding features that assure *greater productivity* are:

HYDRAULIC COUNTERBALANCE SYSTEM for removing the *entire* weight of the rail milling heads from the rail. This system permits maximum rail accuracy for finishing cuts since relative position of the rail heads on the rail does not influence rail level.

WATER-COOLED HEAD MOTORS assuring ample power for high metal removal while maintaining proper operating temperatures. Bulky, clumsy, off-balance head design eliminated.

SIMPLIFIED MACHINE CONTROL SYSTEM immediately noticeable by the almost *complete* absence of manual controls. Customary time consuming levers, handles and wrenches excluded.

NEW FEED RAIL ARRANGEMENT eliminating tangled unsightly customary hose and cable services to milling heads.

EXTRAORDINARY HYDRAULIC CLAMPING MECHANISMS providing maximum machine rigidity for full power, heavy-duty, rough machining operations.

These G&L HYPRO planer-type millers are offered in 14 table capacities from 36" to 144", quill size 10", water-cooled head motors 50-75-100 hp, 24 spindle speeds to 600 rpm . . . power feed to quills ¼ to 20 ipm, head saddles ½ to 40 ipm, table 1 to 80 ipm.

For more information on G&L 10-inch quill HYPRO planer-millers, contact your nearest Giddings & Lewis representative, or write direct.

LITERATURE AVAILABLE:
For complete specifications on G&L HYPRO quill-type planer-millers, write for Bulletin No. 108.

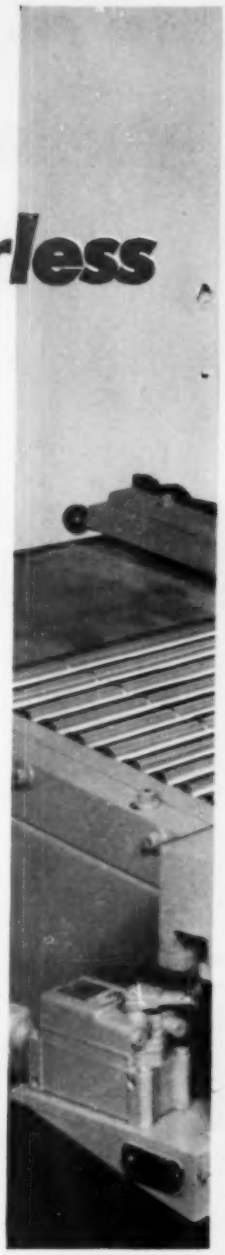
G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-75

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

New Cincinnati Filmatic No. 3

and New Ideas in Centerless

Reduce Cost of Grinding Long Multiple Diameter Parts



It's time to take a new look at wide-wheel infeed centerless grinding. This low-cost method was developed by Cincinnati Centerless Specialists many years ago. The latest equipment illustrated here, covers a much wider range of parts. The machine is a new CINCINNATI FILMATIC No. 3 Centerless and the accessories incorporate the most modern ideas in centerless grinding:

Electro-hydraulic automatic infeed unit with a unique variation... dual rate feed control and adjustable time delay between feed rates.

Automatic magazine loading fixture, mounted on movable stand.

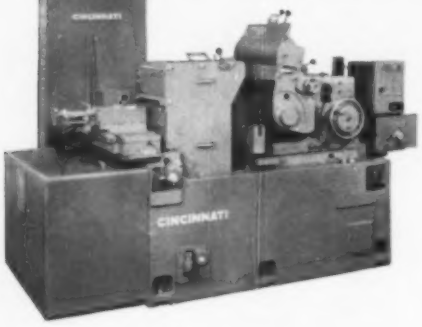
Disappearing end stop, for hydraulic push-through ejection of work.

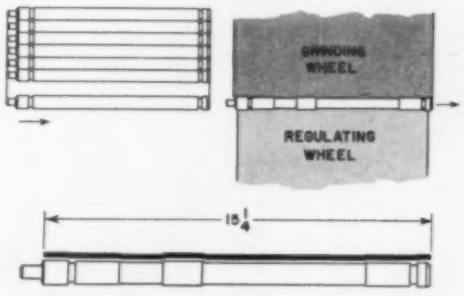
Accurate profile power truing for grinding and regulating wheels.

40 hp drive to the grinding wheel.

This type of CINCINNATI FILMATIC Centerless equipment gives your older wide-wheel grinding machines a high-cost rating which should be corrected now. And in addition, many multiple diameter parts, tediously ground one diameter at a time, can be Cincinnati centerless ground at a small fraction of their present cost. Our Centerless Grinding Specialists would like to show you what can be done. Get a copy of our catalog No. G-664-2 and then give us complete details.

CINCINNATI FILMATIC No. 3 Centerless Grinding Machine. Catalog No. G-664-2. Brief specifications in Sweet's Machine Tool File.





Drawing of part and diagram of operating cycle. Heavy line indicates ground diameters. Stock removal, from solid, ranges from 1/64" to 1/16". Production 40 per hour at 80% efficiency.

CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

Automatic magazine feed is coordinated with dual rate automatic infeed cycle and disappearing end stop for hydraulic loading and push-through ejection of work to rear of machine, a CINCINNATI FILMATIC No. 3 Centerless Grinder. Operation: grind long multiple diameter work from the solid.

CINCINNATI

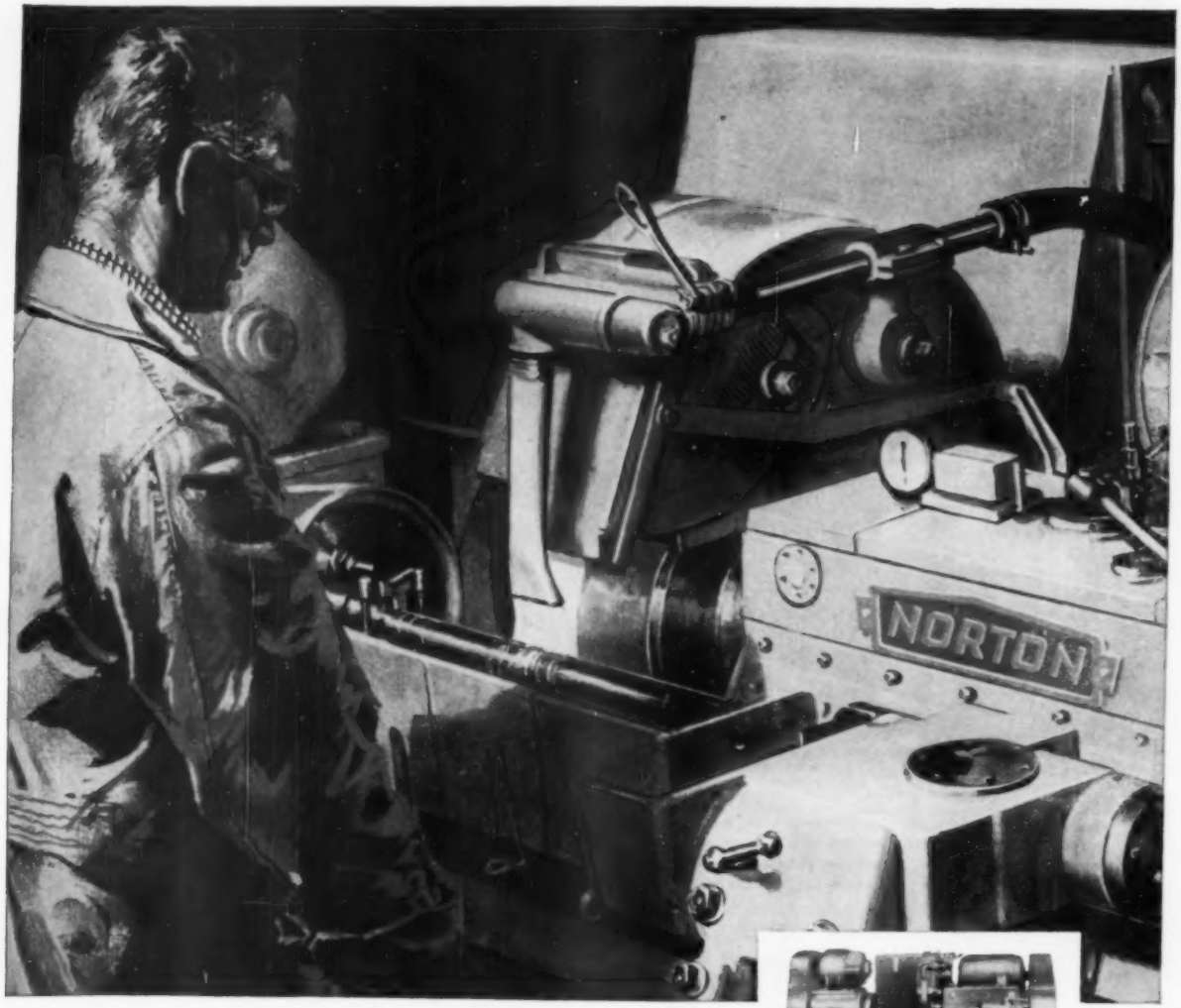
MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

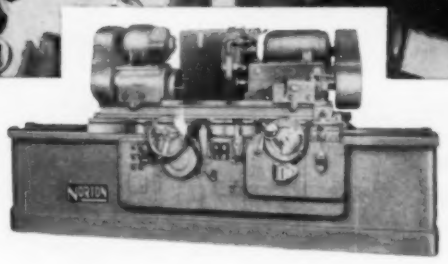
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

Norton Type CTU Cylindrical Grinders knock out production lags . . . to give you

bigger grinding profits

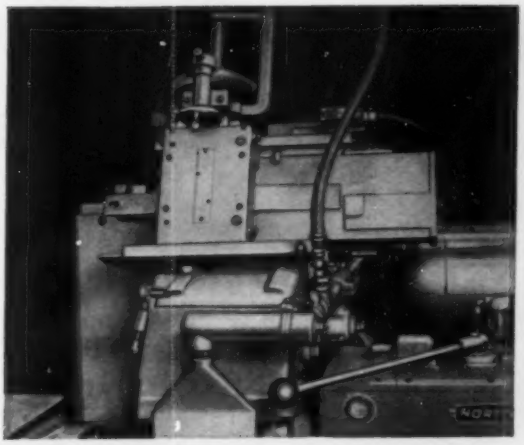
Standard Norton Type CTU Semiautomatic Grinders in 4" to 14" swings have the features you need to raise your profits. Automatic accessories for wheel truing, work loading and many other functions are available to further reduce manual effort and operator attention.



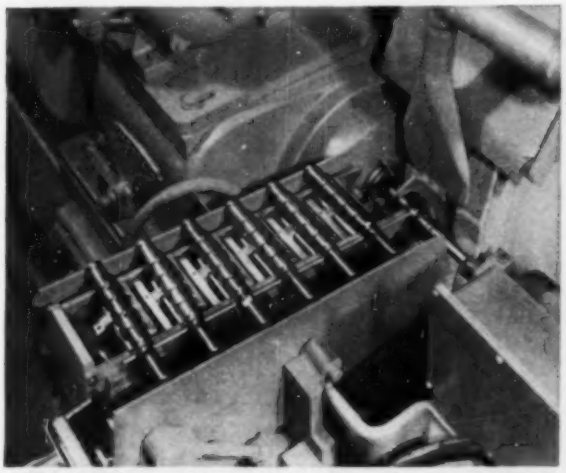


This 10" Norton machine is one of the CTU family of general purpose and semiautomatic precision cylindrical grinders — top performers in anybody's book. They lick production lag with a unique combination of speed, accuracy, flexibility and durability. Production line and job shop users report that Norton CTU's have doubled production, replaced several machines, eliminated extra operations. Write for Catalogs 531, 1488 and 1787.

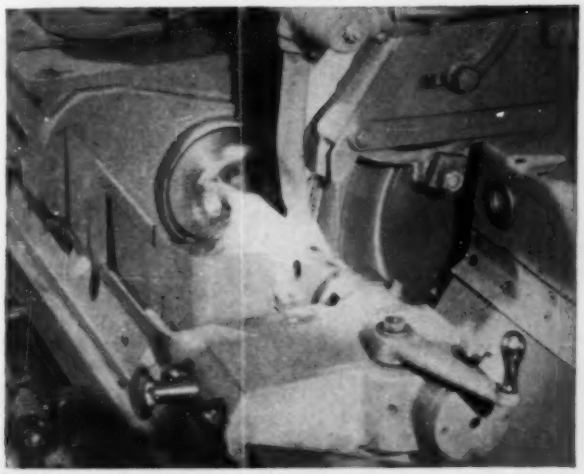
These accessories boost your profits... give you the "Touch of Gold"



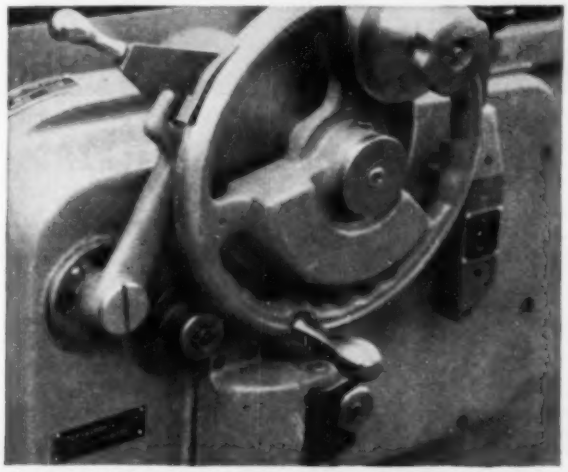
Automatic Truing knocks out time delay of manual operation. Abrasive and diamond savings provide an added "Touch of Gold."



Fast Automatic Loading and Unloading through precise mechanical means. You rule out production lags from worker's fatigue and enable your operators to attend more than one machine.



Automatic Wheel Contact Accelerator reduces over-all cycle time and speeds production. You never "grind air" because wheel head movement adjusts to grinding rate only after the grinding wheel touches the work.



Automatic Wheel Wear Compensator eliminates interrupted production. It compensates for reduced wheel diameter by resetting the wheel head at each truing — whether or not operator is present.

Norton CTU Grinders and Accessories are sound investments for increased profits. They can raise your production by 100%. Remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

To Economize, Modernize with **NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit

. . . attained with the New SIP HYDROPTIC 6A Jig Boring and Milling Machine

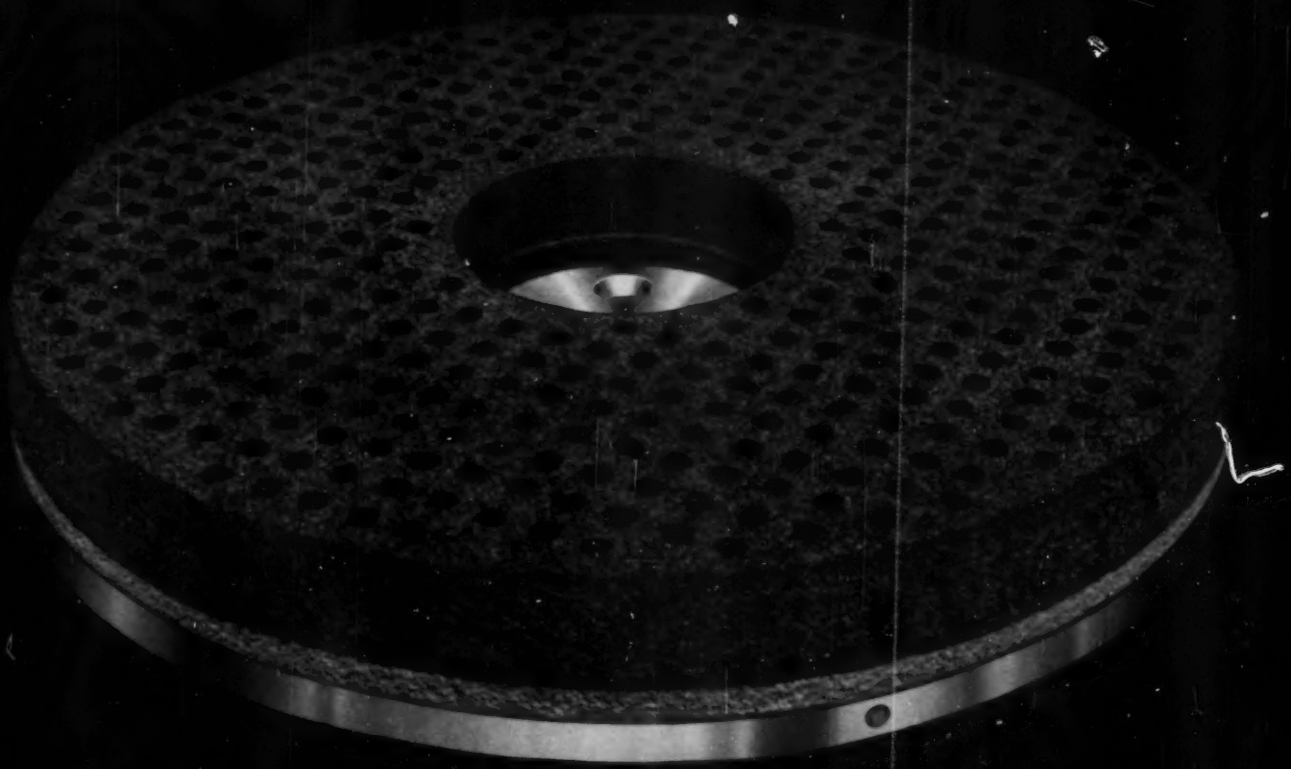
Due to unprecedented cutting ability . . . increased range and capacity . . . simplification of controls . . . and ease of operation, the HYDROPTIC 6A is unmatched in performance.

Up to **30% increase** in productivity has been realized with the AUTOMATIC COORDINATE REPEATING DEVICE DIR (optional equipment) which repeats successively the initial settings made during the machining of the first workpiece.

For complete information, send for Catalog No. 1149.

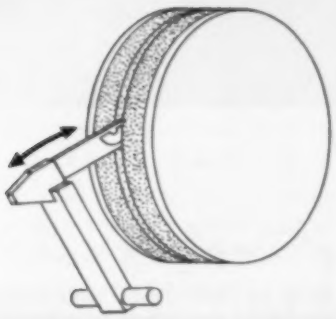
As with all SIP HYDROPTICS, *accuracy is based on* SIP *High Precision* STANDARD SCALES.

AMERICAN SIP CORPORATION • 100 EAST 42 STREET, NEW YORK 17, N.Y.



Gardner disc cuts costs of grinding cast iron cams

...shows highest production per disc in 3-way competition

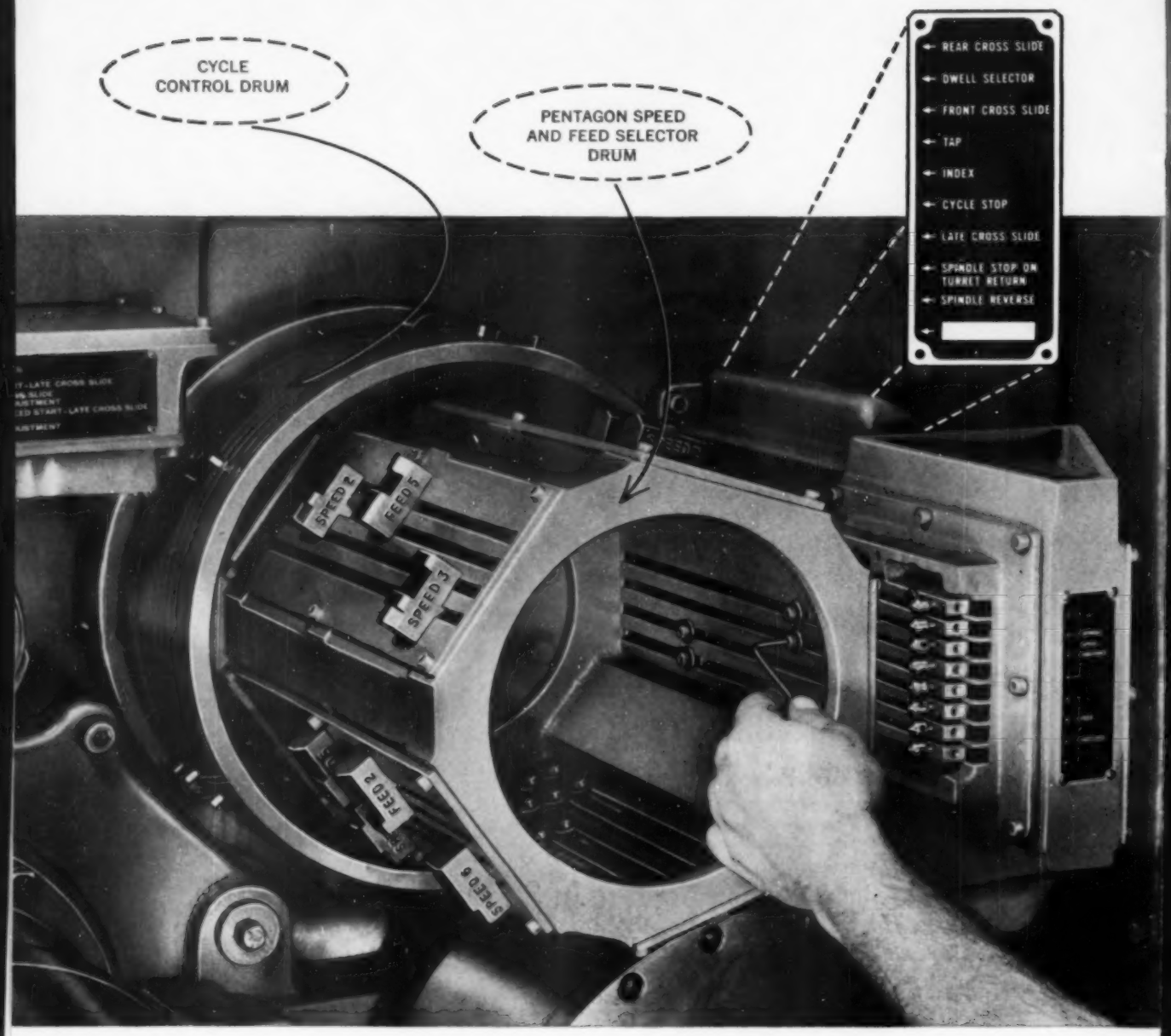


Production Test	
Disc "A"	5000
Disc "B"	6000
Gardner	7284
Workpiece	Cast Iron Cam
Operation	Grinding both sides of workpiece
Stock Removal	.045"—each side
Flatness	±.0015"
Parallelism	.001"
Uniformity	.001"

GARDNER

abrasive discs

BELOIT WISCONSIN



Here's Engineered Setup Simplicity in Action...

At DeRuss Machine Products, fast setup on their 2 ACs poses no problems. By merely screwing pins into the cycle control drum, any desired combination of operations is rapidly set up. As the pentagon speed and feed selector drum moves in and out with the AC's turret, easily-attached trip blocks placed on its five faces shift the turret from rapid traverse to any of six feeds upon contacting electrical switches on the control box at its right. Spindle speeds are also selected in the same manner.

DeRuss found other benefits . . . in the 2 AC's cross slide flexibility . . . in the roomy tooling stations which permit easy setup and effective use of multiple and combined cuts—all of which enable handling of 25-piece lots economically, as well as large lots of a week's production or more.

What gives DeRuss Machine Products their

COMPETITIVE EDGE

in today's market?

Why does this progressive 150-man Philadelphia job shop:

- HAVE A 6-MONTH BACKLOG OF ORDERS?
- CONTINUE TO OPERATE ON TWO SHIFTS DAILY?

Because, during the last two years, they modernized by replacing older, slower, less-profitable turning machines with four new Warner & Swasey 2 AC Single Spindle Automatic Chuckers.

In the words of Mr. Russo, *"Service* is our company philosophy. So we frequently have to break in on existing machine setups to quickly handle rush jobs. We find fast setups and small lots a 'natural' on our ACs. Frankly, we were driven to modernization. Competitive shops — with their Warner & Swasey ACs — were badly underpricing us on available jobs.

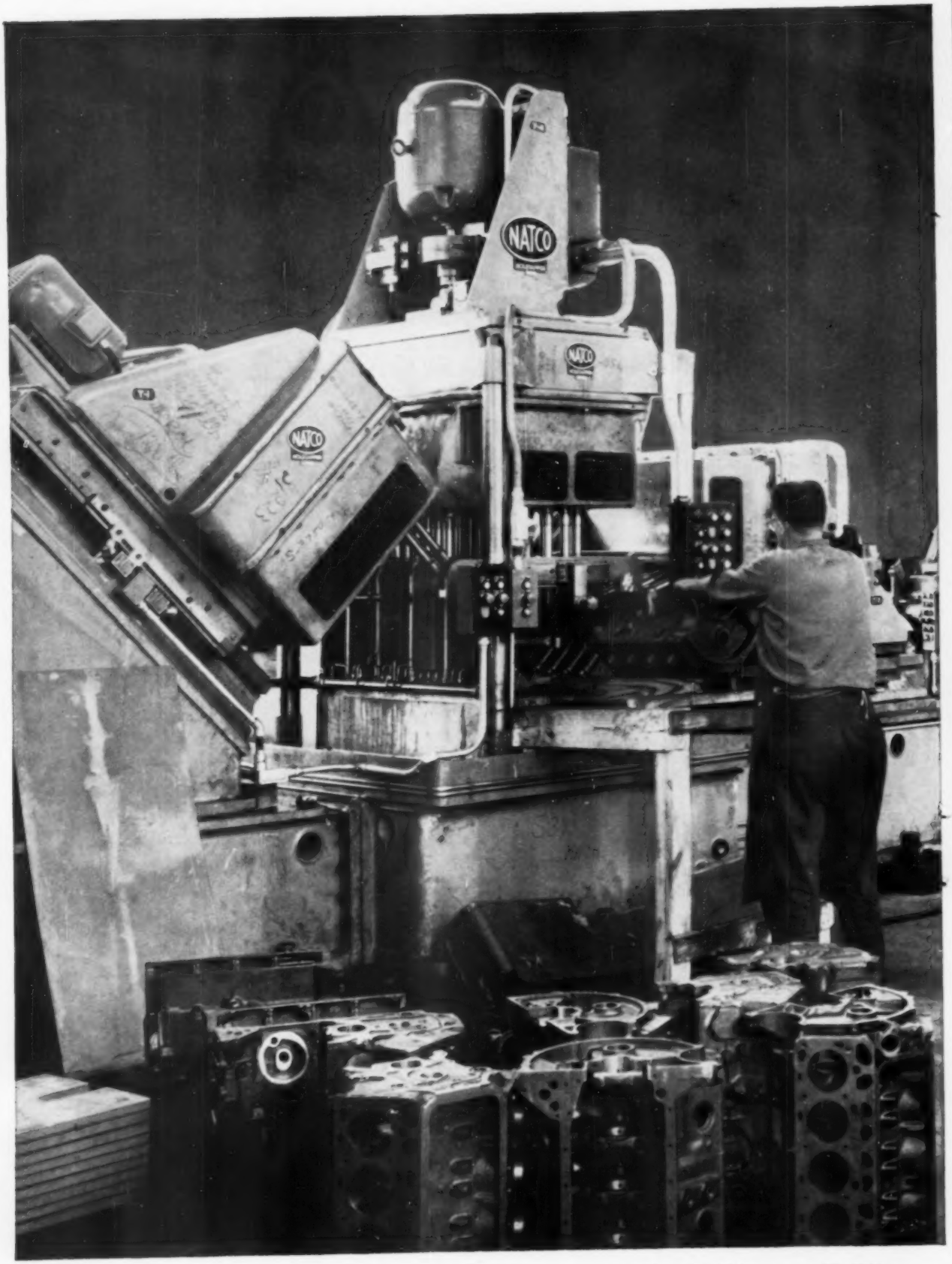
"And in order to have ready-made *capacity to produce* in the economic upturn that lies ahead — we're now ordering two new 3 ACs."

Contact your local Warner & Swasey Field Engineer and get the complete, factual story of what a well-planned modernization program can do to give your plant the competitive edge.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER,

FASTER, FOR LESS...WITH A WARNER & SWASEY

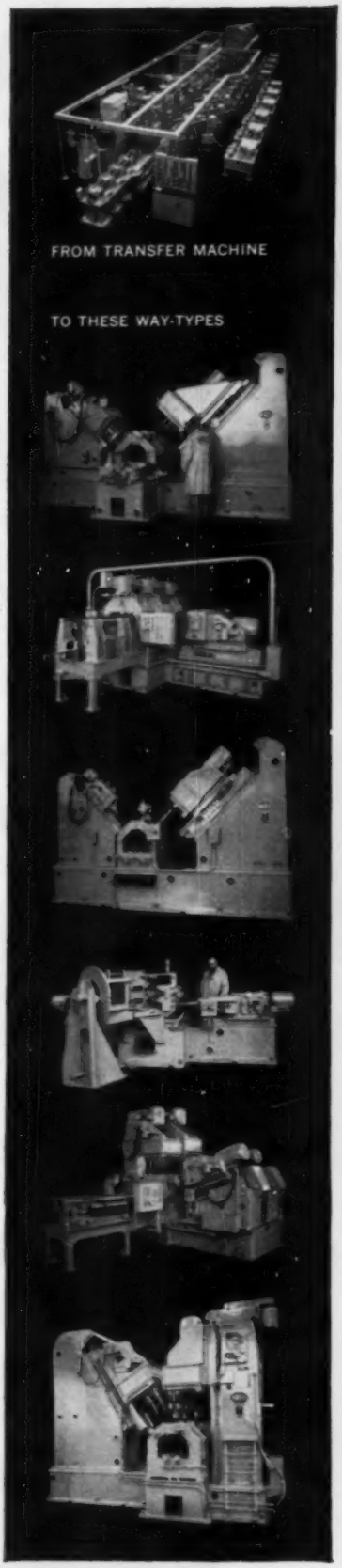

NATCO
NATCO
NATCO

Must your transfer machine go to scrap every time your model changes?

Certainly not. For example, the way-type machines shown here were once stations in an automated straight-line transfer machine. Now they will begin their second life as individual machines on a shorter-run lower-production assignment.

Each station in your Natco transfer machine—whether drilling, boring, milling, sawing or chamfering—is a machine tool in its own right. With modifications and new tooling, it may serve you for many years beyond its original "single-purpose" life.

When product changes call for new tooling, consider adapting the previous machinery to a new use—and realize substantial savings. Natco engineers and manufacturing facilities are at your disposal to make the necessary modifications. Call your nearby Natco representative today to discuss converting your equipment.



NATCO

Multiple-spindle drilling, boring, facing and tapping machines. Special machines for automatic production.

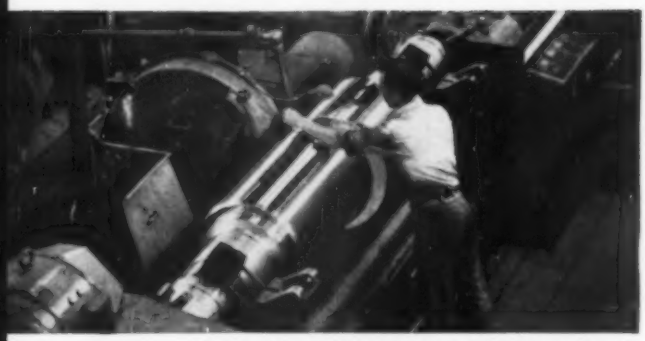
NATIONAL AUTOMATIC TOOL COMPANY, INC.

Dept. 294-A, Richmond, Indiana

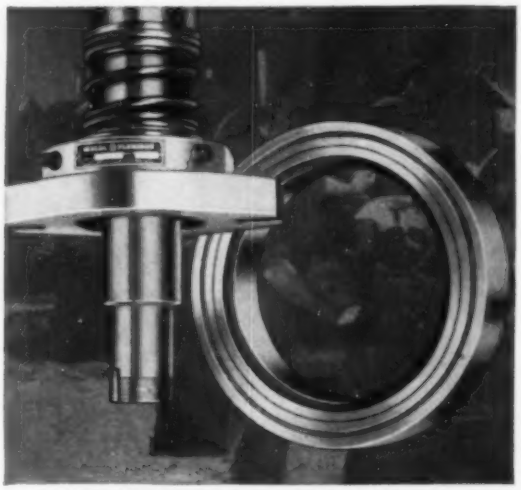
Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles. Distributors in other cities.

PROOF OF QUALITY

REPUBLIC COLD DRAWN CARBON BARS are used in the manufacture of Shotgun Barrels by Harrington and Richardson, Inc. Mr. Arthur F. Hird, Chief Engineer, states his reasons in a letter reproduced on the opposite page. For information on how Republic Cold Finished Steel may help solve your manufacturing problems, contact your local Republic office or mail coupon.



CHATEAUGAY PIG IRON QUALITY IS PROVED time after time by the superior results achieved in producing giant mill rolls. One such roll is shown being finished to an extremely smooth surface. Other requirements include high strength, wear and heat resistance, and ease of machinability. Chateaugay, Republic's exclusive pig iron fills the bill perfectly. For details on low phosphorus, copper-free Chateaugay, mail coupon.



A LATHE FINISH OF GROUND SURFACE QUALITY is reported by Sealol Corporation, Providence, Rhode Island, in the production of mechanical shaft seals using Republic Free-Machining ENDURO® Stainless Steel Bars. In addition, ENDURO's excellent physical properties overcome shaft wear and attack by corrosive elements. Republic can furnish ENDURO in a complete range of analyses, in the best form to meet your needs. Send coupon for data.

HIGH QUALITY IRON POWDER PARTS are easier to produce using Republic CDF Iron Powders. CDF means Controlled Dimensional Factor in three types of powders—Type "G" for growth, Type "N" for normal (no dimensional change), and Type "S" for shrinkage after sintering. Send coupon for booklet ADV-763 containing full information on test evaluations, chemical composition, and physical properties of Republic CDF Iron Powders.

HARRINGTON & RICHARDSON, INC.

MANUFACTURERS *Fine Arms*

Since 1871

WORCESTER 10
MASSACHUSETTS
U.S.A.

H & R. ARMS CO., LTD. MONTREAL, CANADA

PLEASANT 7-8341
CABLE ADDRESS HARRICH

January 1958

Republic Steel Corporation
Republic Building
Cleveland 15, Ohio

Gentlemen:

Ever since Harrington & Richardson, Inc., manufacturers of all types of small arms, was organized in 1871, their Metallurgists and Engineers have been experimenting to find the most suitable material for the manufacture of Shotgun Barrels. The steel required had to be of uniform structure and high quality with physical and dimensional stability. It also had to be well suited for machining at higher feeds and speeds, effect longer tool life, produce better surface finish, and provide the higher ultimate strength required by today's high pressure, smokeless powder ammunition.

Manufacturers of Gun Barrels are all too familiar with the specific problems involved. Operations such as Deep-Hole Drilling, Deep-Hole Reaming, Deep-Hole Bore-Burnishing, and Long-Length Turning operations as affecting polishing can make or break a process if such operations are beset by material problems causing high operational costs and excessive rejects.

Republic Cold Drawn Carbon Bars are the answer to the problem. For the past five years Harrington & Richardson, Inc. has been using one and three-sixteenth diameter, cold finished, magnetic tested, stress relieved bars with a maximum of success.

Harrington & Richardson, Inc. has found that the uniformity of structure eliminates hard spots in machining - the bugaboo of surface finish - and produces a barrel of uniform strength capable of withstanding great forces.

The quality of the steel is reflected in the surface finish achieved. Republic Cold Drawn Carbon Bars are relatively free of sub-surface defects and incipient cracks appearing at the final turning and burnish "bore buttoning" operations. Its physical and dimensional stability reduces the need for constant machine adjustments and straightening operations. All of these characteristics combine to reduce rejects to an absolute minimum effecting low operational and material costs.

Republic Steel Corporation can indeed be proud that this material enables Harrington & Richardson, Inc. to offer higher quality firearms to sportsmen at very moderate prices.

Very truly yours,

A F Hird

Arthur F. Hird
Chief Engineer

AFH:cm

ALL AGREEMENTS ARE CONTINGENT UPON STRIKES, ACCIDENTS AND OTHER DELAYS UNAVOIDABLE OR BEYOND OUR CONTROL.

REPUBLIC STEEL

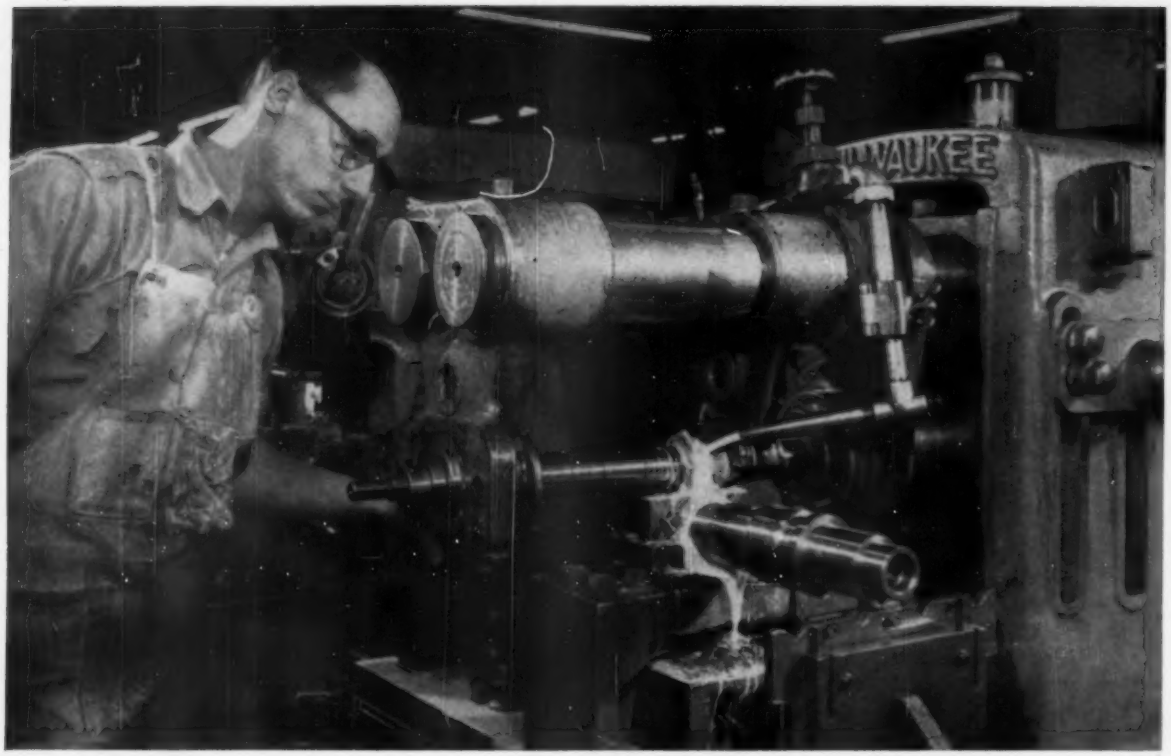
World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION
DEPT. AM-5382
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:
☐ Cold Finished Steel Bars ☐ ENDURO Stainless Steel
☐ Chateaugay Pig Iron
☐ Please send Booklet ADV-763 on Republic CDF Iron Powders

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____



NEW GULFCUT HEAVY DUTY SOLUBLE OIL

IMPROVES MACHINING PRACTICE 4 WAYS

On jobs that call for an emulsifying cutting oil, you'll get the best possible results with Gulfcut Heavy Duty Soluble Oil. Here's what it can help you do:

1. **MAKE YOUR TOOLS LAST LONGER!** With Gulfcut Heavy Duty Soluble Oil you get more effective cooling because of its higher surface-wetting qualities . . . better lubrication because of its excellent extreme pressure characteristics. Both of these properties help prolong tool life, even on alloys of low machinability.

2. **TAKE HEAVIER CUTS AT HIGHER SPEEDS.** This heavy duty oil forms a thin, tough anti-weld film between the tool and the work and between the tool and the chip . . . permits heavier cuts to speed up production.

3. **GET FINER FINISHES.** Case histories in Gulf's files prove that Gulfcut Heavy Duty Soluble Oil has been used to produce a 6-micron finish . . . comparable to that of plate glass.

4. **PROTECT PRODUCT, EQUIPMENT AND PERSONNEL.** This oil contains a special rust inhibitor to protect tools, machine and work piece against rust and corrosion. It also contains an effective germicide to help eliminate rancidity and odor.

Get the full efficiency-economy story on new Gulfcut Heavy Duty Soluble Oil now. Call your Gulf Sales Engineer, at your nearest Gulf office, or write for bulletin.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF

double value

from "DOUBLE LO-HUNG" SPINDLE DRIVE . . .

"AMERICAN" Hole Wizards Provide:

1. ***High spindle speeds at low gear velocities.***
2. ***Heavy drilling, boring and large tapping speeds at low tooth pressures.***
3. ***Faster tapping through spindle reverse speed-up.***

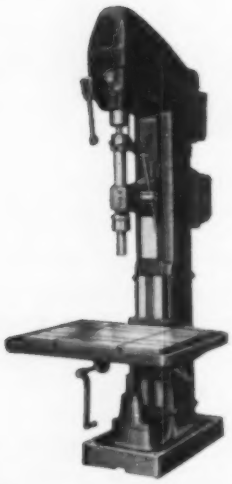
The "Double Lo-Hung" Spindle Drive is an exclusive "AMERICAN" Hole Wizard feature. This drive divides the speed range into two separate ranges; the high speeds through a small gear to minimize gear velocities; the low speeds through a large gear to reduce gear tooth pressures under severe service.

This design in combination with its nitrided Spindle and Sleeve, Timken Mounted with outside adjustment for Spindle Bearings, guarantees maximum life, dependable operation and spindle stability for "AMERICAN" Hole Wizards unequalled by other designs.

• ***Bulletin No. 328 tells the story***

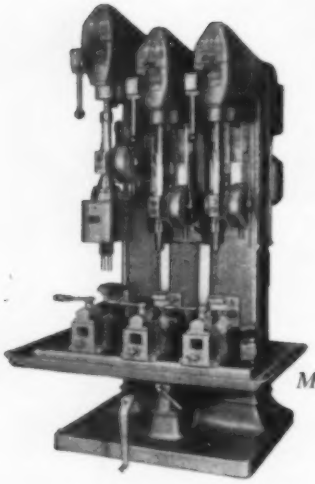
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



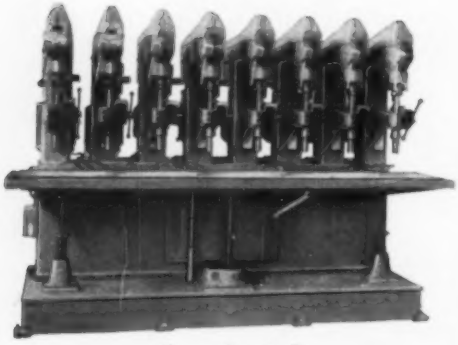
Column type

Avey has the right one

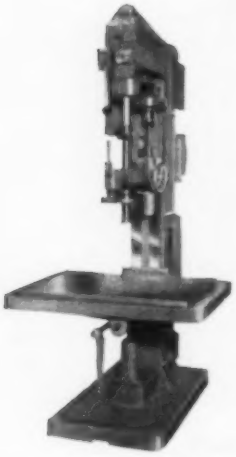


Multi-spindle

Bench type

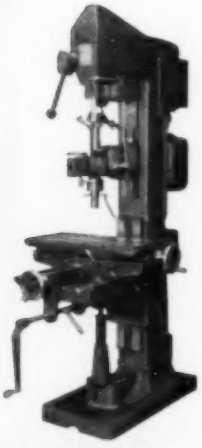


Super 8-spindle



Automatic cycle machine

Round table



Compound table

standard machines

The profit-making features of our standard drilling and tapping machines can be combined in more than 100,000 different ways. One of those combinations exactly meets your requirements, and you can get it quickly.

Capacities in cast iron from very small numbered drills to 2″; No. 32 Jacobs chuck to No. 4 Morse taper.

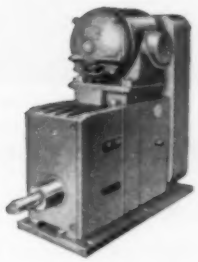
Six or 8 speeds up to 12,000 rpm; 4 feeds. Column or bench type, with wide range of swing; 1 to 8 spindles.

Available features include micrometer stop collar, telescoping spindle guard, dynamically-balanced rotating parts, rack-and-pinion-operated motor plate, rugged involute spindle construction, and automatic cycling.

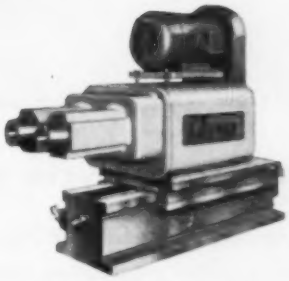
Tool Room machines are available with No. 2, 3, or 4 Morse taper. You pick the table you need: large (34″ x 25″), round (18″ diameter), or compound (25″ x 12″).

for Avey makes them all

Avey

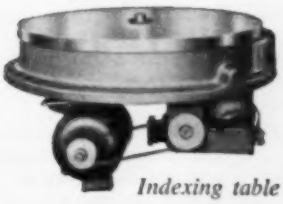


Cam feed unit

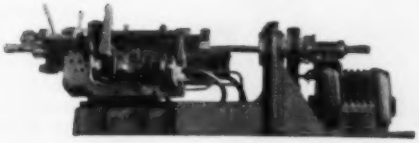


Precision boring unit

Type A unit



Indexing table



Avey-draulic feed unit

production machines

You can increase your profits on unit costs, floor space, machine-handling time, and operating time with our high-production machines, built of standardized modular units:

Automatic cam feed units for drilling, tapping, reaming, hollow milling. No. 1, 2, or 3 Morse taper. Mount at any angle. Fully or semi-automatic.

Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, rapid return. Strokes 12″ to 30″.

Precision boring unit. 5-20 hp; 12,000 lb. maximum thrust; non-metallic ways. Positive depth control; adjustable feeds.

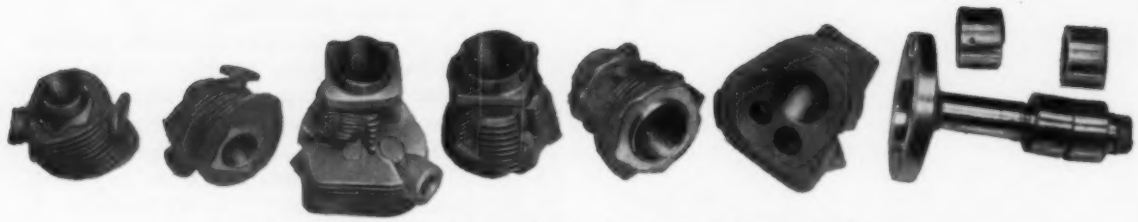
Type A unit. High-speed ball-bearing drilling unit for variety of applications. Capacity in cast iron: $\frac{3}{16}$″ or $\frac{3}{8}$″. Spindle speeds: 1200 to 3600 rpm.

Automatic index tables. Rapid, accurate indexing to .001″; 16″ to 80″ diameter.

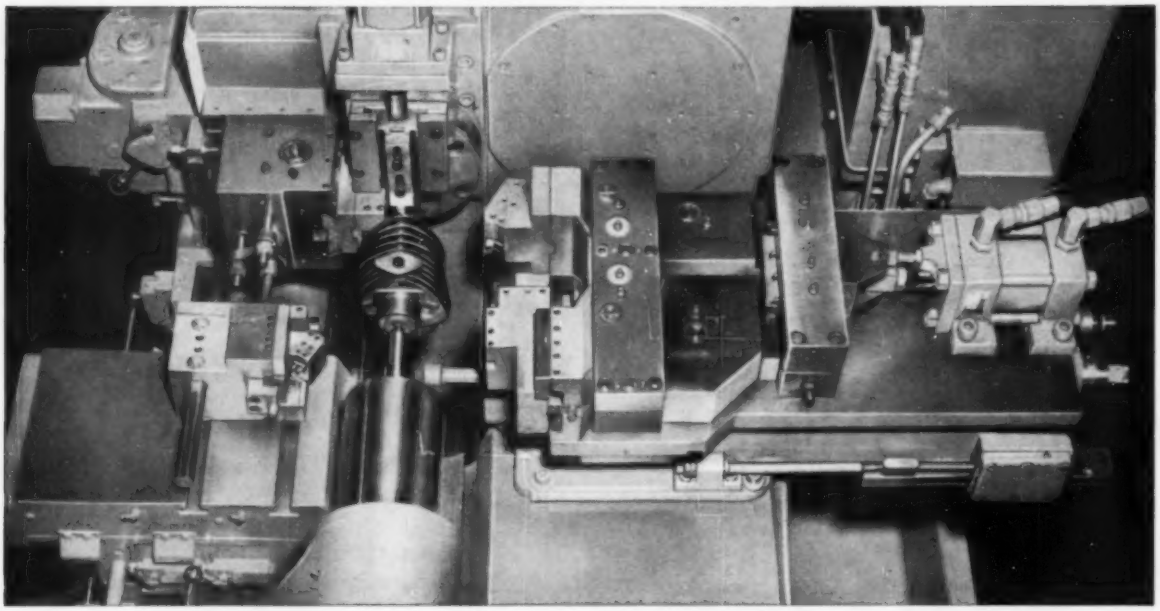
These units can be mounted on standard steel bases and columns for either linear or rotary operations.

Avey Division, The Motch & Merryweather Machinery Company, Box 625, Cincinnati 1, Ohio.

drilling, tapping, production machines



Six different sizes and types of workpieces are handled easily on this job. Extra expanding mandrel and sleeves at right are for different sizes.



How Harley-Davidson speeds motorcycle part production

Machines both ends in single chucking, using Gisholt No. 12 Automatic to get maximum accuracy, cut production costs

This well-planned setup reveals how Harley-Davidson Motor Co., Milwaukee, Wis., is handling cast iron front and rear cylinders.

Smart tooling on a Gisholt MASTERLINE No. 12 Automatic Production Lathe handles 6 different sizes and types of workpieces. Change-over is fast and easy. A special headstock-mounted, air-operated locating stop speeds work handling.

While tools in the front carriage turn and chamfer at one end of the piece, tools in a headstock-mounted auxiliary slide chamfer the I.D. on the other side. Simultaneously, tools on the rear slide face both ends for length. At the end of the cut, tool blocks on the rear independent slide swing open automatically to provide tool relief before withdrawal. Floor-to-floor time on the part shown is 1.2 minutes, only 1.8 to 3.6 minutes for the other 5 workpiece types and sizes.

The new Gisholt MASTERLINE No. 12 Automatic Production Lathe is designed specifically for high production operations; yet, it is flexible enough to handle a variety of similar parts in small repeat lots. The automatic cycle frees the operator to handle other machines or do other work.

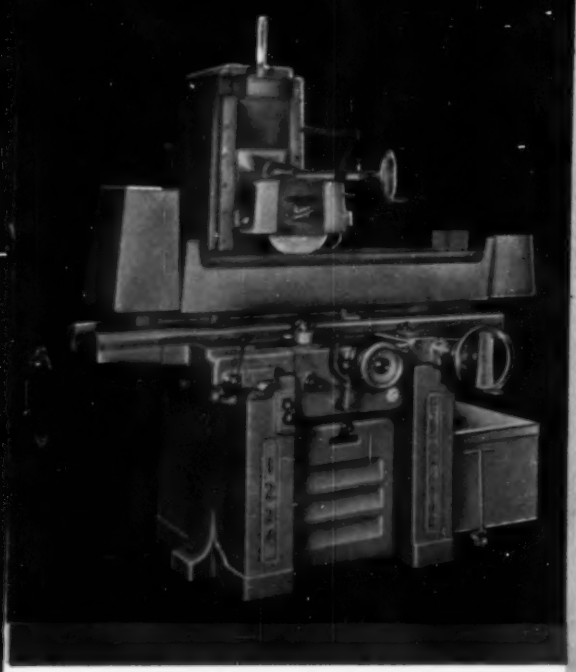
Make a note to phone your Gisholt Representative today. Ask him to come in and show you where the fast automatic cycle and flexibility of the No. 12 Automatic Production Lathe can cut your floor-to-floor time and reduce your costs.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

WRITE GISHOLT TODAY for advance data on the new Gisholt MASTERLINE No. 12 Automatic Production Lathe. Ask for Form 1178.



man-hours mean more
with features
engineered for operators

NEW HYDRABRASIVE

precision surface grinders
no. 824-no.1218-no.1224-no.1230

Controls Grouped For Easy Accuracy – No knuckle busting! Every operating control is located for free, natural, physical and optical convenience. Power feeds and hand feeds (standard equipment) are interlocked for positive safety.

Hydraulic System Runs Cool – Without Extra Attachments Won't change machine dimensions, throw work out of line! A low-pressure, high-volume, air-cooled totally enclosed hydraulic system provides smooth power, shockless table reversal, and eliminates air locks.

Deep-Throated, Balanced Capacity – A full 12" under a 12" wheel! 18" under the wheel available as an extra. 3 5/16" clearance under head for grinding between die pins.

Smooth, Easy Accuracy – Saddle adjusts transversely on a precision ground screw with backlash eliminator . . . moves on ball bearing and hardened steel ways. For effortless travel up and down, head and motorized exclusive Abrasive spindle are balanced on elevating screw and ways.

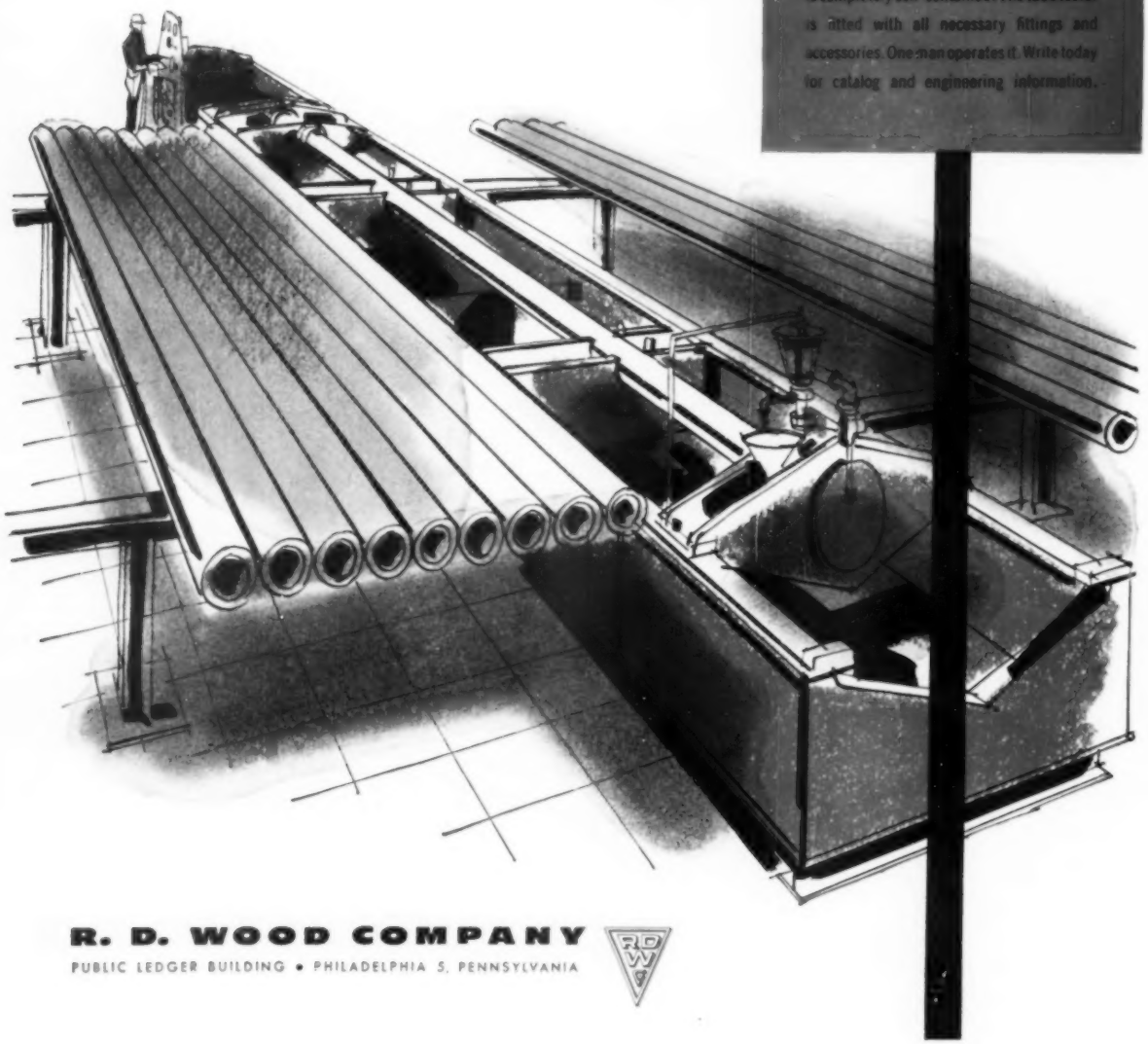
Free Illustrated Catalog Shows How Hydrabrasive Operator Engineered Features Add Up To Easy Accuracy, Fast! Write For Your Copy, Now.

ABRASIVE ABRASIVE
MACHINE TOOL COMPANY
EAST PROVIDENCE, RHODE ISLAND

Apply your special requirements to basic R. D. Wood press designs

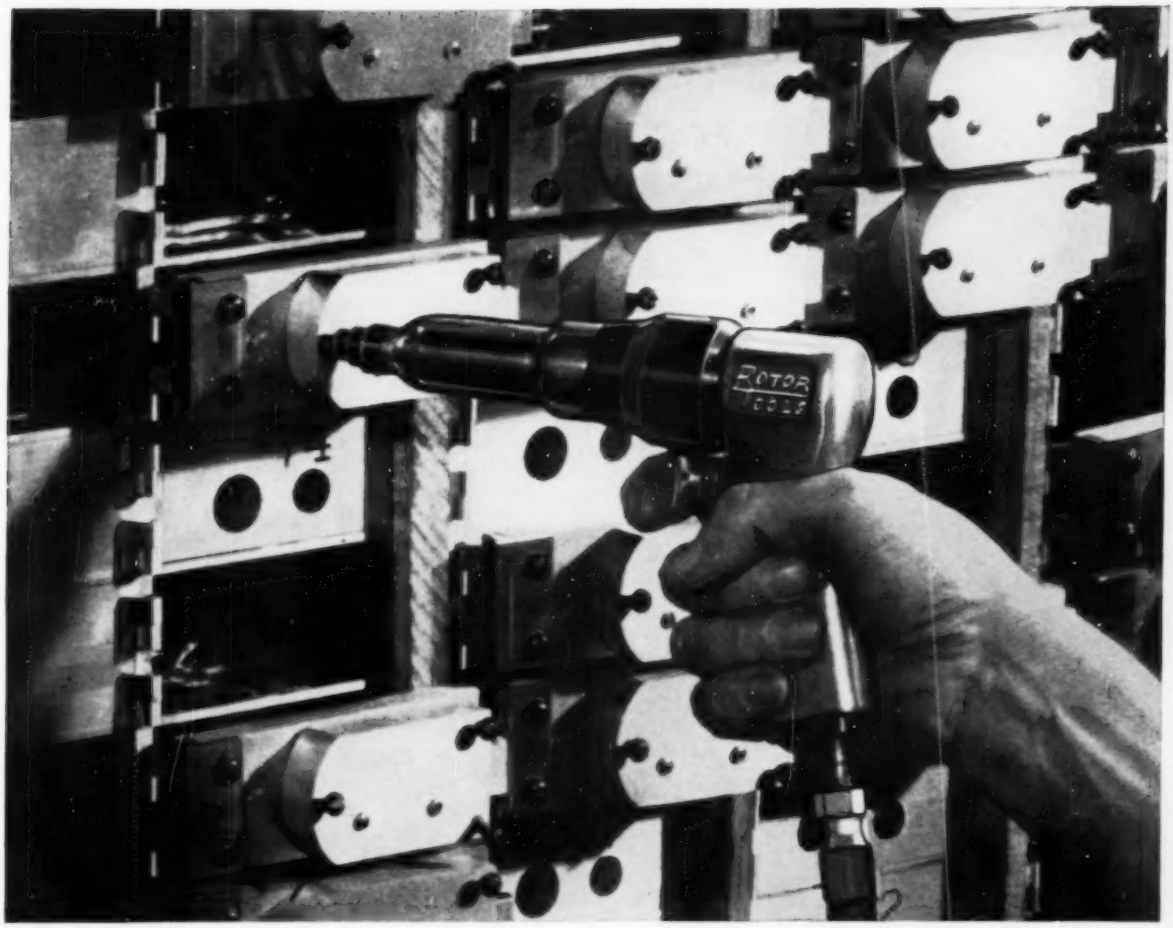
Here's the sensible, economical way to design your own press. Working with numerous *basic* models, R. D. Wood engineers apply *your* specifications and modifications to produce the press precisely suited to your needs. No starting from scratch. No needless delays in construction. No paying for more design than you need. You're sure of quality too. For every Wood press is constructed of selected materials by master craftsmen. Here is your assurance of precise operation and long, trouble-free performance. When you need a press, bring your specifications to Wood.

R. D. Wood Hydrostatic Tube Testing Machine for tubes of 4½" to 12" diameter nominal sizes and in maximum lengths of 35'-0" at hydrostatic test pressures from 700 to 1500 psi. Resistance head can be adjusted for testing shorter lengths. Unit is completely self-contained. The tube tester is fitted with all necessary fittings and accessories. One man operates it. Write today for catalog and engineering information.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA



Cuts screw-driving time 66%

APPLICATION: Rotor S-02 Air Screw Drivers on vault assembly job *paid for themselves in 8.6 weeks.* **RESULT:** Time per unit with former hand screw drivers was 13 seconds. With the 2000 rpm S-02 PRC, it is 4.4 seconds.

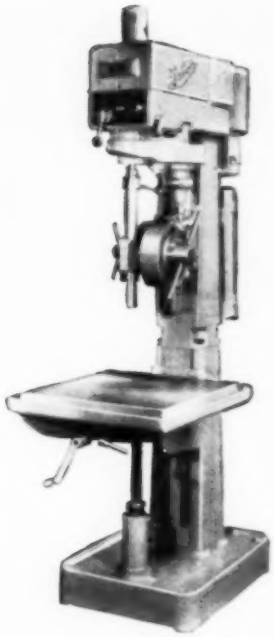
Rotor S-02 screw drivers and nut setters are available with three types of drives, with reversible or non-reversible motor, lever or pistol throttle, and with long or short angle head (with six different spindles). At least three speeds for each model. All models are quieter. Ask for a demonstration on your job. Bulletin 46 free on request. The ROTOR TOOL Company, Cleveland 32, Ohio.

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

ROTOR TOOLS
CLEVELAND, OHIO

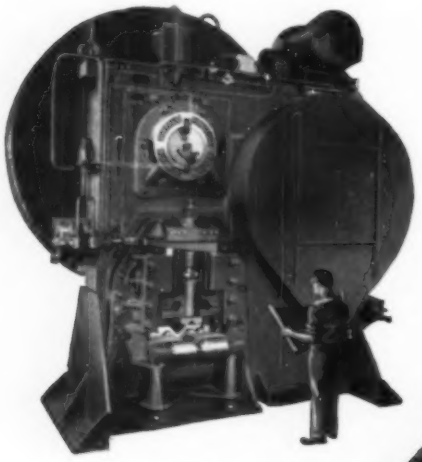
SPEED PRODUCTION
CUT COSTS
WITH "BUFFALO" MACHINE TOOLS

The completeness of the "Buffalo" machine tool line enables you to select the exact units you need to fit your production and maintenance needs. Shown on this page are only three of the many items in the complete line. Also bearing the reliable "Buffalo" name are individual lines of drill presses, bending rolls, wrapping rolls, punches and mill shears. For the full story on how "Buffalo" machine tools can perform your operations better, faster, more economically, contact your nearest "Buffalo" machine tool dealer. Or, write us direct, outlining your needs.



"BUFFALO" "RPMster"

The "RPMster" brings you unmatched versatility and smoothness for all your drilling, reaming and tapping operations. Convenient controls in the head give you quick, easy speed changes from 100 to 3000 RPM. New gearless drive provides an absolute minimum of vibration at all speeds. Write for Bulletin 3967.



"BUFFALO" BILLET SHEARS

Available in 11 sizes, these sturdy shears handle rounds, squares and flats in a variety of sizes. They're *fast*. The smallest size shears thirty 2¼" rounds, the largest six 10" rounds per minute. Each cut is clean and square — no smearing to conceal porosity. Shear penetration is only 3/16", assuring a neat, accurate vertical fracture. Quality output matches speed of shearing. For full details, write for Bulletin 3295-C.

"BUFFALO" UNIVERSAL IRON WORKER

This versatile machine cuts, punches, notches, shears, slits, copes, miters — without changing tools. Angles, tees, channels, bars, flats — it takes them all in stride. Massive electrically welded steel plate frame insures a long life of dependable operation. Write for Bulletin 360.

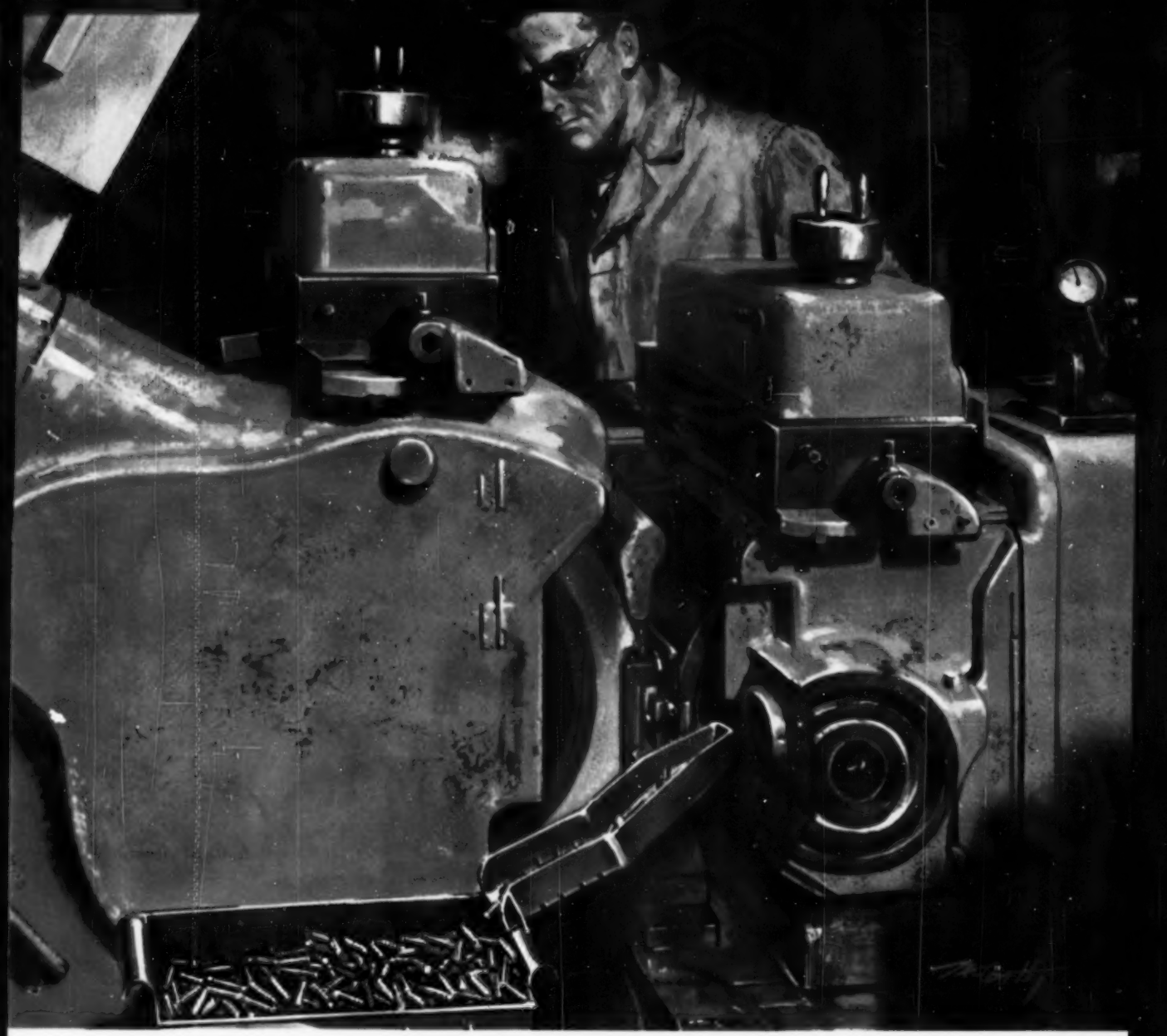
"Buffalo" Machine Tools feature the famous "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

BUFFALO FORGE COMPANY

509 BROADWAY • BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING



How 7,000 pieces per hour get the "Touch of Gold"

Here a centerless thread grinder is adding value the most modern way . . . applying the "Touch of Gold" automatically, with a Norton crush-trued wheel that is grinding threads in set screws at an average rate of 7,000 per hour.

You too can benefit by Norton leadership in continually improving grinding wheels and grinding methods . . . which helps proportion your labor, overhead and wheel costs as favorably as possible, so that you can produce with increased efficiency and economy.

Norton stocks more than 200,000 types and sizes of grinding wheels . . . and brings to every industrial area the many products and services that have become synonymous with the "Touch of Gold".

NORTON COMPANY, General Offices, Worcester 6, Massachusetts.

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ABRASIVES

Making better products . . . to make your products better

HARDINGE
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MASTERS and PADS

FOR BETTER PERFORMANCE — BETTER PRODUCTION

AND

PROFITS

STYLE "S"
MASTER COLLETS and PADS
The Only Master Collet with
No Work Pressure On The Screw
Available For: Cleveland-Cone
Greenlee—Gridley and Acme-Gridley
National Acme—New Britain
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Write for FREE Bulletins

STYLE "B"
MASTER FEED FINGERS and PADS
Pads Cannot Work Loose
No Screws — No Pins
Available For: Brown & Sharpe
Cleveland—Cone—Davenport—Greenlee
Gridley and Acme-Gridley—National Acme
New Britain—Warner & Swasey

Carried in Stock For Prompt Delivery at:

Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Rochester, N. Y., Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, Toronto, Montreal

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

DoALL *Announces . . .*

a NEW Super Precision

Hand-Operated

SURFACE GRINDER

Tailored to Fit the Operator for Easier, More Productive Work

- **NEW-DESIGN VERTICAL FEED HANDWHEEL** in easy-to-reach, safe position
- **ADJUSTABLE MACHINE OPERATING HEIGHT**
- **SMOOTH TABLE ACTION**—manual traverse through timing belt drive (hydraulic drive optional)
- **RIGHT- or LEFT-HAND TABLE DRIVE**—handwheel position instantly interchangeable
- **VERTICAL HANDWHEEL** graduated in tenths (Zero Slip Rings optional)
- **SADDLE LOCK** for form and plunge grinding
- **1 H.P. MOTORIZED SUPER PRECISION SPINDLE** with anti-friction bearings
- **KNEE-RECESSED** cabinet base

"Human Engineering" guided DoALL engineers in the design of this new surface grinder. Low in cost yet superior in accuracy, it is manufactured to set completely new performance standards in a hand-operated surface grinder.

Every design feature and control function was carefully considered for the operator's convenience. Now the most exacting work may be turned out with least operator fatigue. With tolerances closer than ever before, this assures users of the Model DH-612 a definite competitive advantage.

Standard machine includes not only the exclusive features above, but also telescoping dust guards and one-shot lubrication system to table, saddle, column ways, elevating screw, gears and bearings. A full range of optional accessories is available including "Cool Grinding" through-the-wheel mist coolant system. Table travel is 7″ x 13″; work height, 0 to 12¾″; vertical feed to .0001″ and crossfeed with vernier to .0002″.

In ease of operation, accuracy, power and completeness, there is no finer grinder. Full details are at your DoALL Store—or write . . .

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TYPICAL DoALL STORE

THE DoALL COMPANY, Des Plaines, Illinois GR-26

MACHINE TOOLS ..... CUTTING TOOLS ..... MEASURING INSTRUMENTS ..... SHOP SUPPLIES IN STOCK

for the best buy....
buy **BATH**

GROUND FROM THE SOLID

JOHN BATH & CO., Inc.

22 Mann St., Worcester, Mass.

PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

letters from production men . . .

Thread grinders serve as research tools

The versatility of Jones & Lamson Thread Grinders is hardly tested in the conventional production of hobs, taps, gages and threaded parts. In our toolroom, using the thread grinder as a basis for "Rube Goldberg" development we have produced precision racks, small form-profiled milling cutters, oil grooves and grinding wheel crushers.

While serving the purpose as a necessary piece of equipment, it also provides a platform from which solution-seeking thoughts may be launched in determining many additional production problems. The application of the thread grinder to toolroom problems is putting the best foot forward in achieving quick, accurate and dependable shop accessories.

— Production Specialist —

One machine replaces three

Our Jones & Lamson #5 turret lathe equipped with tracing attachment is doing the work formerly done by three conventional turret lathes. This Jones & Lamson machine does the rough and finish bore on a 6.5 diameter, 10.0 long magnesium ring. There are nine bore diameters, eight shoulder dimensions, all held to close tolerances. The accurate repetition and smooth operation of this machine reduces operator strain and produces better parts.

In our operation, full utilization of machine tools is a must. We appreciate our Jones & Lamson in helping to attain these goals.

— Assistant Superintendent —

Not afraid of competition

When the bids and quotations are opened, it's the shop with the J & L tools that gets the business. J & L turret lathes are the backbone of our job shop. Over 80% of our work is composed of machining the various alloys of stainless steel. J & L's speed, feed, power and rigidity coupled with your rapid traverse makes it possible for us to undertake jobs that our competitors wouldn't think of attempting, unless they too have J & L tools.

The availability of a J & L factory trained representative is an intangible asset to us. There isn't another machine tool builder in our area that has this service so readily available. Time and again his courtesy calls, at no expense to us, have resulted in the solving of production problems.

— Owner —

Accuracy is a "must"

We have used Jones & Lamson equipment for 17 years. In the past six months I have been partly responsible for replacing some of the turret lathes. One feature that makes Jones & Lamson our choice is the versatility possible with the 5" chuck opening.

Our principal reason for choosing Jones & Lamson again is that its rigidity and accuracy can be thoroughly depended upon for internal and external boring. The satisfaction of knowing that the close tolerances required *will* be held is vastly important in the production of our aircraft parts, because it cuts to the minimum the spoilage and rejection of parts and man-hour costs.

With our future program of jet aircraft and missiles, these factors are even more important than formerly. Close tolerances and the fitting of mated parts are an absolute necessity, and we feel sure that Jones & Lamson machines will give us quality and quantity of parts to meet our requirements.

— General Foreman —

Straight from the shoulder

I am a man that came up the longest and most interesting way. Apprentice, turret lathe operator, toolmaker, Sub Foreman, Turret Lathe Foreman, Gen. Foreman, Gen. Supt. and I think I know what I am talking about. I will tell you guys in plain shop language, the best damn feature of one of the finest turret lathes built — now hold your breath. This is it. The J&L Preselector.

Features:

#1 The best design. Past, Present, and Future. You were right the first time. No design change.

#2 Ease of training apprentices and future supt's.

#3 Safe to operate. No broken backs or torn shop coats.

#4 Less motion than any other design. Means no wear, no maintenance, no down-time. Hours x man's time + burden = Dollars saved.

#5 No personnel problems, as long as you let them operate the machine with the simple preselector.

P.S. We have saved 35% with our new #5 tracer.

— General Superintendent —

The lady has a point

When we order Jones & Lamson machinery, my desk is never cluttered with unnecessary paper work. The precision, durability, and dependability of your equipment keep repairs and breakdowns to a minimum, thus saving precious time and tedious work.

Jones & Lamson machinery is help we can rely on with confidence.

— Production Secretary —

A few words from Texas

Texas is predominantly an agricultural state, and as such, raises farmers and ranchers rather than mechanics. However, it is rapidly becoming an industrial state. But — and here is the catch — farmers and ranchers are not very good machine operators.

Short runs predominate in our industry, and short runs call for turret lathes. The Jones & Lamson Hydraulic Tracing Attachment can make turret lathe operators out of farmers and ranchers in a very short time.

— Procurement Engineer —

No strain — no pain

The advanced progress in cutting tools has created a challenge to the machine tool industry. One of your answers is a heavier headstock, a heavily ribbed bed, and a rigid universal bridge carriage (supported on front and rear bed ways).

For instance: — Our new #9A-4½ J & L Saddle Type Turret Lathe performs a normally twenty minute operation in three minutes. Steel forgings (twenty inches in diameter) have one-half inch of stock removed from *both* O.D. and I.D. with a .015 feed and a spindle speed of 489 RPM. There is no sign of vibration under the strain nor does the machine falter.

"Rigidity" built into Jones & Lamson's equipment to permit a heavy cut at high speed is my answer to increased production.

— Mechanical Engineer —

Tough job made easy

The operation was rough turning cylinder barrels on a Fay automatic lathe.

This machine had 2 sets of tool blocks with 2" square tool bits, one set feeding into the cut from the front and one set feeding into the cut from the rear. The material was Chrome Molybdenum steel, hot forged. We removed as much as 100 pounds of metal from this forging in less than five minutes. The cuts were 2" wide and about ¼" thick. It was a high production job, as there are twelve of these cylinder barrels to a motor. When the chips cooled, due to the heat generated in removal, they were a deep blue color. This was as tough a job as I have witnessed. This machine demonstrated the design and quality of Jones & Lamson lathes.

— Machine Buyer —

(names of these customers available on request)

. . . to Jones & Lamson Machine Company

502 CLINTON ST., SPRINGFIELD, VT.

LOW COSTS. USS "T-1" Steel's high yield strength (100,000 psi minimum) and ready weldability combined to reduce weight and keep fabrication costs low.

The trailer frame they couldn't tear apart

—built 25% lighter with USS "T-1" Steel

The first big low-bed machinery hauling trailer built by Timpte Bros., Denver, Colorado was made completely from welded USS "T-1" Steel. They sold it to a large construction firm . . . urged the company to *try to tear it apart.*

That was three years ago . . . and according to Mr. R. R. Ruland, Vice President and General Manager of Timpte Bros., the trailer is still in use. It withstood every test of lugging huge loads over rough, back-country roads.

Since then, Timpte has built hundreds of trailer units designed to carry loads from 10 to 75 tons . . . and now they are building one to haul 100 tons. All are made with USS "T-1" Steel.

Why did they use USS "T-1" Steel? First, they needed steel with sufficient strength to achieve a weight reduction of about 25%. Second, they wanted steel that is weldable and which retains its strength after welding. Third, they had to keep costs low. USS "T-1" Steel filled the bill on every count.

What about your equipment? If it is mobile or stationary, if it must resist impact abrasion or shock, if it needs greater strength, lighter weight and lower costs . . . you can probably build it better with USS "T-1" Steel.

Write for our free book, "USS 'T-1.'" It's filled with practical suggestions and technical information. United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

Remember that we also make USS COR-TEN, USS MAN-TEN *and* USS TRI-TEN *Steels . . . standards for heavy-duty equipment.*

USS, COR-TEN, MAN-TEN, TRI-TEN and "T-1" are registered trademarks

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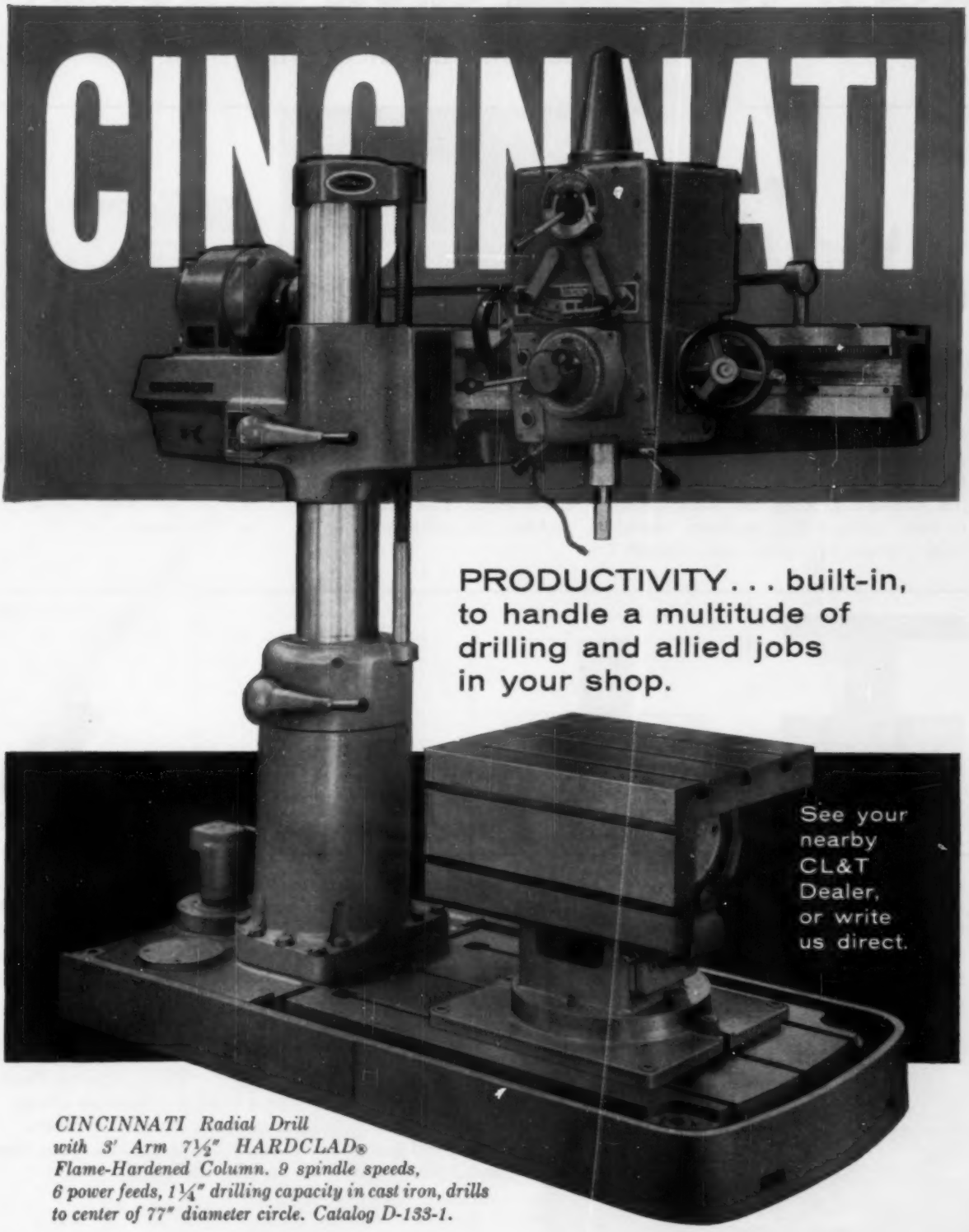
CINCINNATI



PRODUCTIVITY . . . built-in, to handle a multitude of drilling and allied jobs in your shop.

See your nearby CL&T Dealer, or write us direct.

CINCINNATI Radial Drill with 5' Arm 7½" HARDCLAD® Flame-Hardened Column. 9 spindle speeds, 6 power feeds, 1¼" drilling capacity in cast iron, drills to center of 77" diameter circle. Catalog D-133-1.

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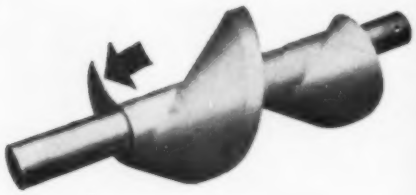
CINCINNATI LATHE AND TOOL CO.

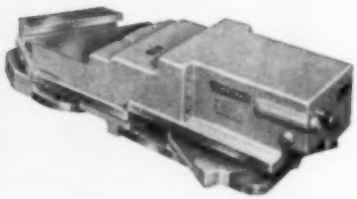
3207 Disney Street • Cincinnati 9, Ohio

"TRAY-TOP" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners

New turning idea is born...

LeBlond Engineers turn trick with tracer

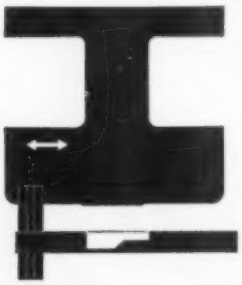


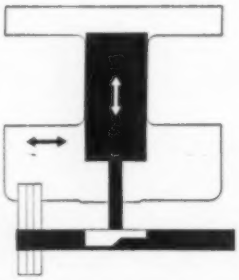


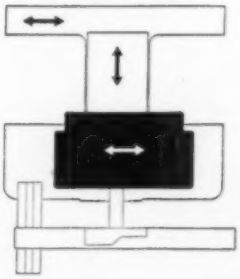
1. Problem workpiece—spiral rotor for pumps manufactured by Roots-Connersville Blower Co., Connersville, Indiana. Shaping just couldn't produce the wide variety of exact contours their engineers wanted. Could rotors be *turned*—automatically?

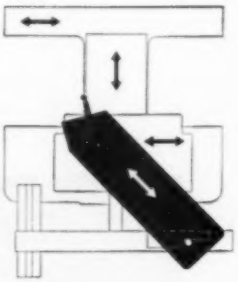
2. Why not? With special end gearing and full nut, we can "chase" the spiral shape like a coarse thread. That's easy . . . the problem is the contour.

3. We'll use Hydra-Trace to *position* the tool (not to trace). We can mount a special length slide on the cross slide to give us feed *between* cuts.







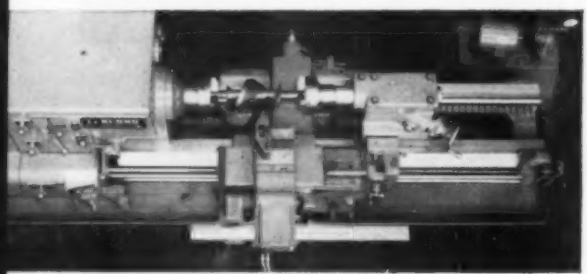


4. Let's see how this looks in plan. The carriage provides length motion for the tool. The template carrier moves lengthwise with the carriage.

5. The cross slide gives cross travel plus automatic tool relief. The template carrier also moves "in and out" with the cross slide.

6. The special length slide gives us feed. Not continuous feed. Just tool-positioning feed that moves the stylus along the template for each successive cut.

7. The template controlled Hydra-Trace positions the tool to produce the contour. During the cut, no feed takes place. Only the chasing action.



8. Here's the finished machine—the LeBlond Contour Chasing Lathe, basically a 32″ Standard Duty. Modifications include: special end gearing, full nut, special length slide, automatic cycling and special heavy duty reversing electrics. Lathe chases leads from 4½″ to 16″.

. . . cut with confidence

The R. K. LeBlond Machine Tool Company

Cincinnati 8, Ohio

LeBLOND of Cincinnati

We welcome the opportunity to solve your special turning problems. Tell us about them. Call or write for an engineering appointment.

World's Largest Builder of A Complete Line of Lathes for More Than 71 Years

BUTTERFIELD
100%
INSPECTED
TOOLS

the complete line

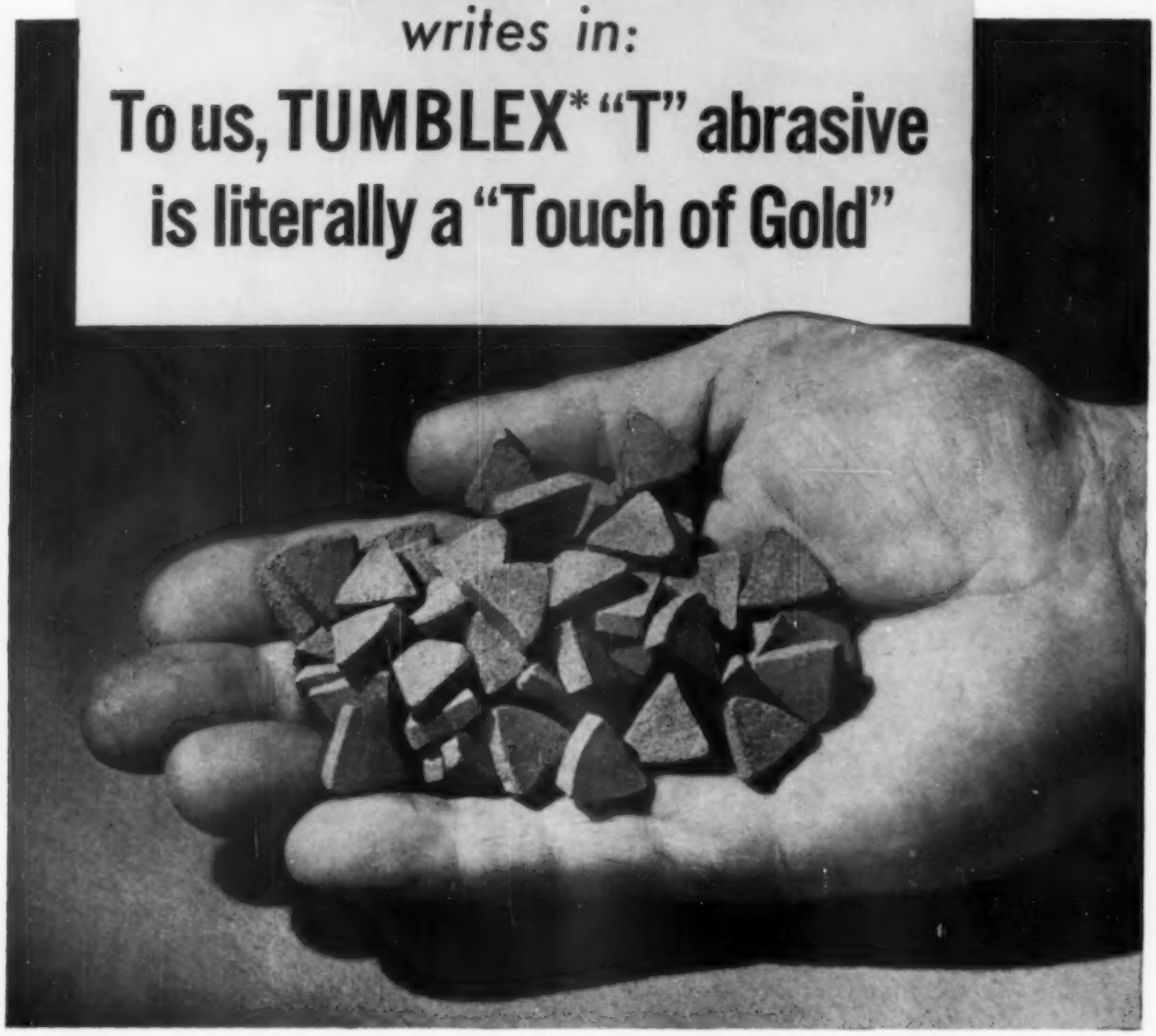
Butterfield offers you everything you want in cutting tools...when you want them...wherever you want them. Drills, reamers, taps, dies, counterbores, cutters, end mills, hobs and carbide tools. Warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York and San Francisco. *See your Butterfield Distributor.*

BUTTERFIELD

BUTTERFIELD DIVISION, UNION TWIST DRILL COMPANY, DERBY LINE, VERMONT

Leading deburring company writes in:

To us, TUMBLEX* "T" abrasive is literally a "Touch of Gold"



Describing one of the revolutionary Norton barrel finishing abrasives, this customer continues:

We formerly were stocking four types of finishing media. By switching to ALUNDUM TUMBLEX *"T" abrasive we have eliminated three types and are getting better results. For example, one particular metal part required six hand operations prior to barrel finishing. Now, with your abrasive triangles, barrel finishing is all that's needed.*

Made of bonded ALUNDUM* abrasive, TUMBLEX "T" has a triangular, non-wedging shape that's excellent for finishing intricate-shaped parts . . . provides long, even wear . . . assures fine, uniform finish, short time cycles and big savings in finishing costs.

Other Norton top-performing barrel finishing abrasives include ALUNDUM TUMBLEX "A" abrasive, for general usage; ALUNDUM TUMBLEX "S" abrasive spheres that get into hard-to-reach areas; and TUMBLEX "N" abrasive, natural stones for producing highest lustre on various parts.

Send samples of parts, any sizes or shapes, to our Sample Processing Department. We'll barrel finish, return samples and report the methods and abrasives you need. Or, when you're in this area, come in and look things over, personally.

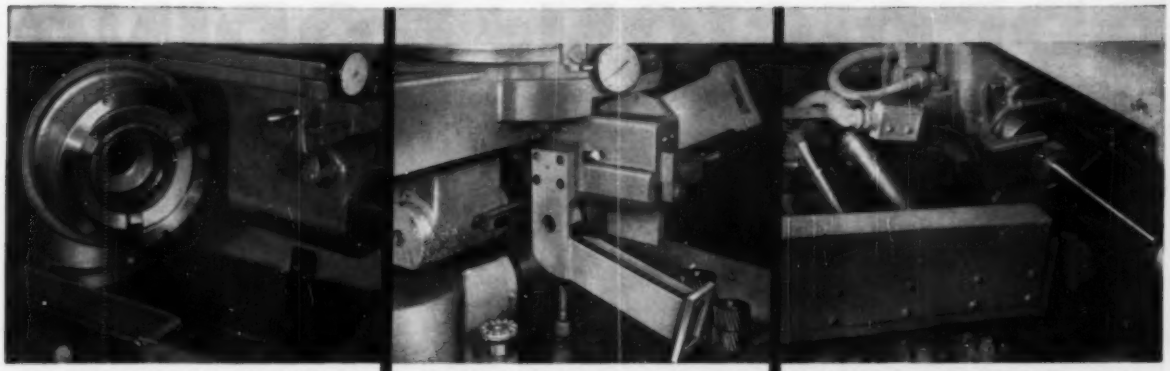
NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

G-343

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels
Grinding Machines • Refractories
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes



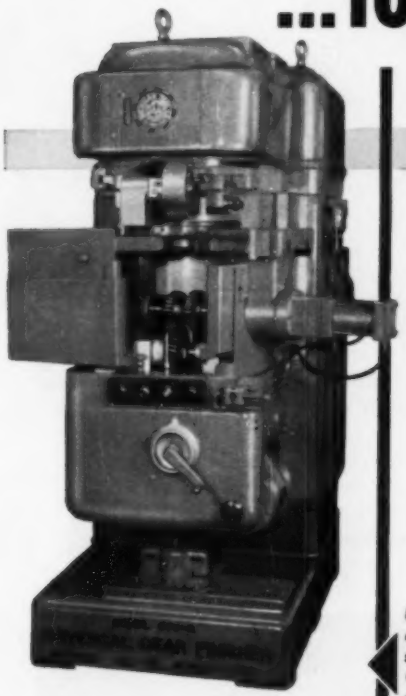
INTERNAL 870-C, only vertical internal shaver where a heavy mass (chuck and gear) drives the cutter. Reversals impose no abnormal loads on cutter teeth. This prevents excessive cutter breakage. Extras—plunge shaving.

UNDERPASS 870 Gear Finisher for fastest shaving—long or short run—of spur, helical, herringbone or shoulder gears. Extras—the new knee, new cutter-saving drive, crowning cutters, easy to set up and operate.

READILY AUTOMATED—Michigan 870 and 870-A shavers can be partly or fully automated. They are the only vertical shaving machines featuring 'straight-through' automation. They can be automated to load or unload from front or back.

TO GET BETTER GEARS AT LOWER COST

...look for the extras



Michigan's latest 870-series Gear Finishers are loaded with EXTRAS. A new knee assembly brings all controls to the front—and puts the operator closer to the work. Operators like ease of setup, vernier and dial locating, and the simple locking. Work located above cutter makes manual loading safer, automatic loading easier. Machine ways are up out of the way of contamination by chips or foreign matter. Timken bearings, extra-rugged fully splined shafts and a shock-absorbent drive, provide a sturdy no-backlash drive. Starts and stops are cushioned to keep cutters operating longer. Every installation has the EXTRA of being individually Michigan Application Engineered to cut costs.

Write for descriptive literature.

UNIVERSAL 870-A (with new knee) permits adjustable automatic upfeed to be used with any of the three basic shaving methods. Extras—faster approach, longer tool life. Optional crown shaving attachment (permits shaving of a series of gears with varied crowns using only one tool).

May we have the Michigan Tool engineering representative in your area show you how Michigan gear finishing can make your geared parts even better.

MICHIGAN TOOL Company

7171 E. McNICHOLS RD., DETROIT 12, MICH., U.S.A.
IN CANADA: COLONIAL TOOL CO. LTD.

PRECISION BORING

SAVE 300 HOURS PER UNIT

on precision boring of gear boxes. Each unit (2 halves) calls for over 200 holes from ¾" to 4½" dia. Boring, spot facing, recessing, milling, tapping and counter boring. Material is aluminum alloy.

with no rejects

hole location accurate to ±.0001"

hole sizes repeated to ±.0001"

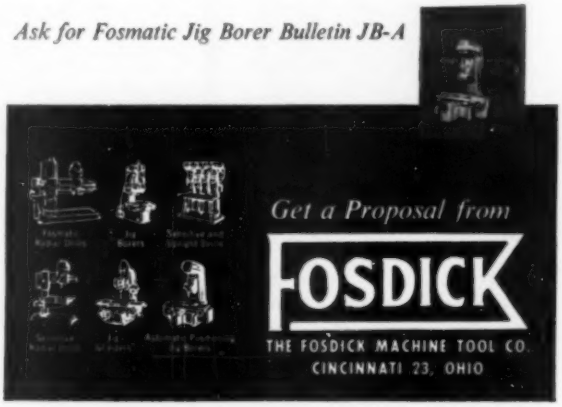
Boring time reduced from 800 hours to 500 hours per unit—with no rejects in all 50 parts—and every one accurate to ±.0001" on hole size and location! Over 200 holes per unit are machined.

Mr. R. Schmidt of Triangle Tool Co., Union, N. J., owner of this Fosmatic Jig Borer, reports, "Two Fosmatic features were largely responsible for this important time saving. First, the Fosmatic's long table travel permitted machining two parts at once. Second, the automatic positioning and Direct Dimension Measuring System work simply and fast. They eliminate confusion and help the operator work accurately and efficiently. Incidentally, that long table travel helped get us several new jobs we could never have handled on our other jig borer."

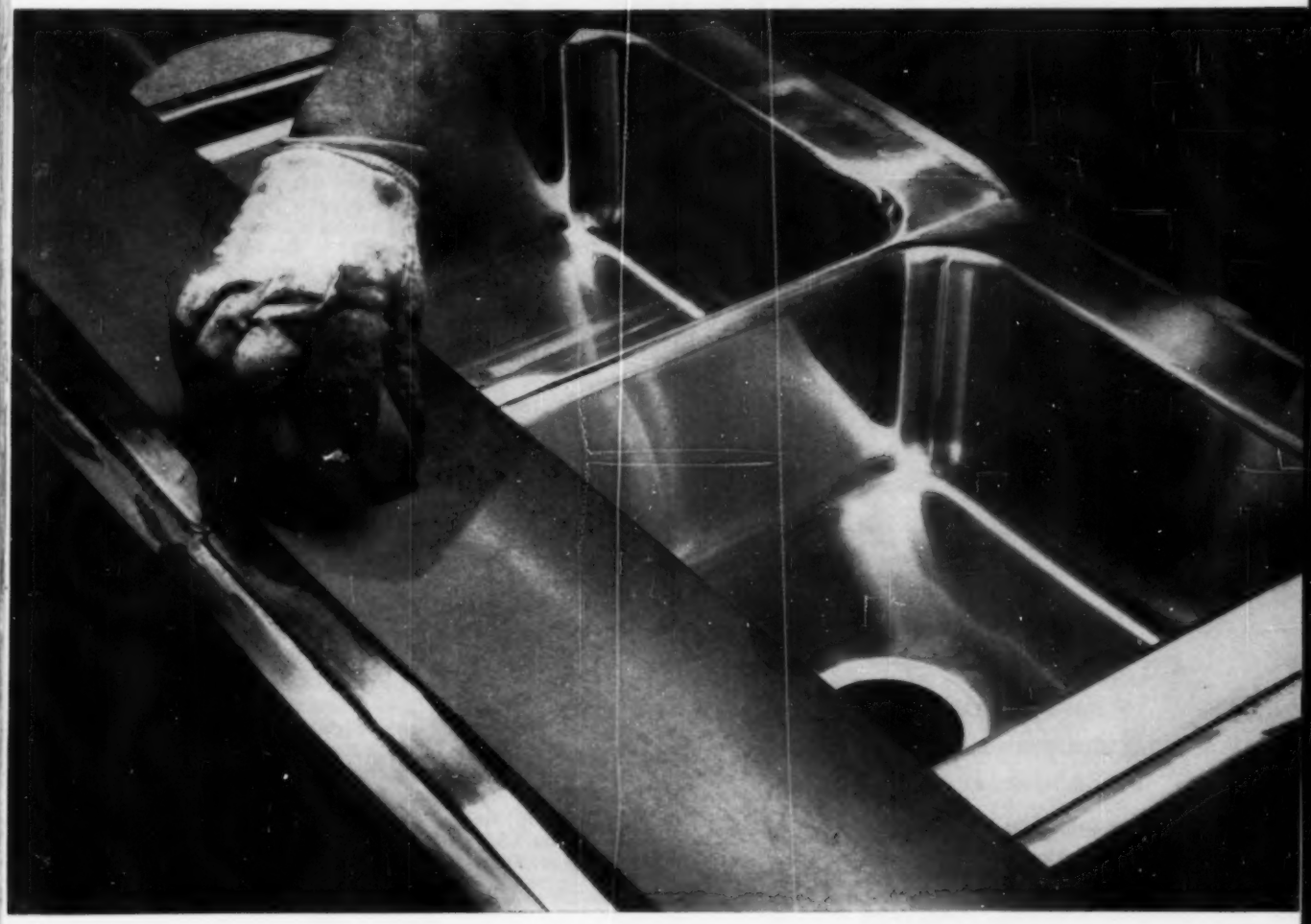
With Direct Dimension Measuring the operator sets dimensions direct from blueprint onto two direct reading drum dials. At the press of a button, the table automatically positions work to ±.0001". On the Fosmatic, this operation and all other machine functions can be numerically controlled by punched tapes or cards.

Fosmatic Jig Borers bring you many important advances in boring technology. Where progress has been so great, the obsolescence of your old machine may be more costly than you suspect. *Why not run a check?* Call your Fosdick Distributor or write us today.

Ask for Fosmatic Jig Borer Bulletin JB-A



Stainless Steel
polishing information:



*Play it cool and don't press

You can polish Stainless Steel to a mirror finish but you can't rush the job. Too coarse a grit, too much speed, too much pressure might scorch or discolor Stainless because steels of this family are not rapid heat conductors.

Use light pressure on the polishing agent, and remember that you can't get a desired finish any faster just because you press harder. Take your time. This is by way of saying that Stainless Steel isn't difficult to fabricate, it's just different.

All your work on Stainless will be expert if you follow the "Stainless Steel Fabrication Book." If you don't have a copy, we'll be glad to send you one. Write on your company letterhead to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS is a registered trademark

United States Steel Corporation–Pittsburgh
American Steel & Wire–Cleveland
Columbia-Geneva Steel–San Francisco
National Tube–Pittsburgh
Tennessee Coal & Iron–Fairfield, Alabama
United States Steel Supply–Warehouse Distributors
United States Steel Export Company

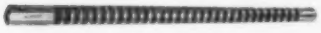
USS **United States Steel**

Save TIME and MONEY cutting KEYWAYS

In one minute and for as little as one cent you can cut a keyway with a Minute Man Keyway Broach Kit. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

Save time with these other
STANDARD STOCK BROACHES

SQUARE BROACHES



HEXAGON BROACHES

***New* ROUND BROACHES**

Used in an arbor or hydraulic press for finishing holes to exact size in *one pass.* 1/8" to 1/4" squares and hex's; 1/4" to 1" rounds. Production Type Keyway Broaches also in stock.

SEND FOR CATALOG AND PRICE LIST

The duMONT CORPORATION
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name .....

Company .....

Address .....

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Cast dies

Dear Sirs:
Under the heading of "Spot News" (*AM*—April 7 '58, p65), mention is made of the following: "Casting, rather than sinking, of forging dies is being investigated."

We are interested in obtaining information along these lines, and anything you can pass along to us regarding the source of your material for the above item will be appreciated.

George J Houting
Milwaukee, Wis

The "Spot News" item was abstracted from an article by Homer L Shaw in the March issue of the Battelle Technical Review, *published by Battelle Memorial Institute, 505 King Ave, Columbus, Ohio*—Ed.

New name

Dear Sirs:
In answer to "Word Wanted" in the "Talking Shop" column (*AM*—Mar 10 '58, p158), I would like to suggest the term "Metalworking Lubricants" to cover this vast field in which many products are employed to this end.

Our own Company has extensive plans in developing new and better products in keeping with this ever-changing field.

I shall continue to follow your magazine in its way of keeping close tabs on industry today.

John P LaForge
General Petroleum Corp
Los Angeles, Calif

Dear Sirs:
. . . "Lubricoolants"?

Carl A Johnson
West Palm Beach, Fla

Chip flusher

Dear Sirs:
In an article titled "Chips flushed from parts in seconds" (*AM*—May 5 '58, p141), you speak of a Swarfmatic made by the Automatic Totalistators Ltd of Sidney, Australia.

Could you give us information as to whether or not there is a

SHOPMATES

N. Jarvis

THIS NEW JOB IS PRETTY TOUGH— YOU SURE YOU UNDERSTAND ALL ABOUT IT? NOW'S THE TIME TO ASK QUESTIONS — I'LL BE OUT OF TOWN TOMORROW, YOU'LL BE ON YOUR OWN — DON'T BE AFRAID TO ASK— O.K.! GO TO IT!!
OLD ZIPPER LIP
ALL SCRAP!! HOW D'THEY EXPECT A MAN TO MAKE A LIVIN'! GIVE A MAN A TOUGH NEW JOB AN' LEAVE HIM FLAT!! — EVEN THE PRESIDENT GETS A LITTLE HELP!!
N. Jarvis

EXTRA DRILLING CAPACITY FOR YOUR TOOLROOM

LELAND-GIFFORD NO. 3 MVB TOOLROOM DRILL PRESS

A companion machine to the widely used Leland-Gifford No. 2 LMS Toolroom Drill Press — providing extra capacity with comparable features and conveniences. This machine is always available to help with heavy-duty production work while handling the general run of toolroom drilling and tapping with effortless speed and ease.

✓ *check these features*

- ✓ Speeds from 33 to 1,800 RPM.
- ✓ Capacity of No. 3 Morse Taper.
- ✓ Extra large 40½″ x 23½″ or standard 24½″ x 23½″ tee-slotted table.
- ✓ 24″ swing with 12″ overhang. Geared power feed with feed rates of .006″ — .012″ — .018″ per revolution.
- ✓ Illuminated indicating shift with cutting speed chart.
- ✓ Conveniently located hand wheel for changing spindle speeds and shifting back gears without stopping machine.
- ✓ Positive stop for accurate depth adjustment.
- ✓ Foot switch start-stop motor control.
- ✓ Counterbalanced sliding head.
- ✓ Built-in light for table and work illumination.

Write for complete information.

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U. S. A.

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INDIANAPOLIS 6
P. O. Box 1051

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2620 Leonis Blvd., Vernon 58, Cal.

NEW YORK
75 S. Orange Ave., South Orange, N. J.

ROCHESTER 12
P. O. Box 24, Charlotte Station

HOW NELCO TOOLS MAKE NELCO TOOLS

Every machining operation on over 700 different NELCO TOOLS is performed more efficiently with a NELCO TOOL!

WHY?...because the versatility, machining speed, superior surface finish and dependability of NELCO TOOLS produce finer tools, more economically.

A NELCO "standard" slab mill dry climb milling the flutes in a 4 flute, 1½" diameter NELCO End Mill. Power feed, 10½" per minute at 600 RPM.

A NELCO "standard" 3" side mill dry conventional milling the flutes in a 2 flute ½" diameter NELCO End Mill. Hand feed at 640 RPM.

A NELCO "standard" 3 flute end mill dry conventional milling the carbide tip seats in a 2 flute ½" diameter NELCO End Mill. Hand feed at 2100 RPM.

These are but three of the hundreds of milling, turning, boring, reaming operations involved in producing over 700 "standard" NELCO TOOLS.

SEND TODAY for the new NELCO Catalog showing over 700 different "standard" carbide and carbide tipped tools. Write:— *Cutting Tool Division, Brown & Sharpe Mfg. Co., Manchester, Conn.*

NELCO TOOLS *For that EXTRA Edge in Production!*

CUTTING TOOL DIVISION

NELCO CARBIDE TOOLS BS HIGH SPEED STEEL CUTTERS

PRECISION TOOLS AND GAGES • MILLING GRINDING AND SCREW MACHINES
MACHINE TOOL ACCESSORIES • PUMPS AND HYDRAULIC PRODUCTS

distributor for this equipment in the US? If so, could you furnish us their name and address?

H O Simon
Rochester, NY

The information for the article came from our Melbourne News Bureau, and although the company concerned has had several inquiries from the US, it doesn't yet have representation in this country.

Therefore we can only suggest you write direct to Automatic Totalisators Ltd, Sidney, Australia —Ed.

Spray-up process

Dear Sirs:
Recently you published an article on a plastic spray gun developed by the Rand Development Corp (*AM*—April 7 '58, p85).

I would be very much interested in getting the address of this company, since we are interested in the possibilities of a hand gun for spraying cellulosic or epoxy resins on steel. In this particular case, we are not interested in utilizing a fiber-glass filler.

If you know of any other concerns who have this type of equipment available, information on them would be much appreciated.

T A Daly
Sharon, Penna

The complete address is Fiber-Resin Div, Rand Development Ohio. We have heard that there is other spray equipment available for plastics alone, and we too, would like to know who manufactures it—Ed.

Helpful Henry

by L. Hoppes

"I'll catch 'er for you,—oops!"

CALENDAR

National Tool & Die Manufacturers Association—Summer Meeting, July 23-26, Mt Washington Hotel, Bretton Woods, NH.

Society of Automotive Engineers—Farm, Construction, and Industry Machinery Forum and Display, Sept 8-11, Milwaukee Auditorium, Milwaukee, Wis.

Instrument Society of America—Annual Instrument-Automation Conference and Exhibit, Sept 15-19, Convention Hall, Philadelphia, Penna.

Society of Automotive Engineers—Aeronautic Meeting and Display, Sept 29-Oct 3, Ambassador Hotel, Los Angeles, Calif.

American Society of Tool Engineers—Semiannual Meeting and Western Tool Show, Sept 29-Oct 3, Shrine Exposition Hall and Statler Hotel, Los Angeles, Calif.

American Society of Mechanical Engineers and American Society of Lubrication Engineers—Lubrication Conference, Oct 14-16, Statler Hotel, Los Angeles, Calif.

Society of Industrial Packaging & Materials Handling Engineers—Annual Meeting and Exposition, Oct 14-16, Chicago Coliseum, Congress Hotel, and Morrison Hotel, Chicago, Ill.

American Machine Tool Distributors Association — Annual Meeting, Oct 16-17, The Sheraton Plaza, Boston, Mass.

Magnesium Association — Fall Meeting and Exhibit, Oct 16-17, Fort Shelby Hotel, Detroit, Mich.

American Gear Manufacturers Association—Semiannual Meeting, Oct 26-29, Edgewater Beach Hotel, Chicago, Ill.

American Institute of Mining, Metallurgical & Petroleum Engineers—Fall Meeting, Institute of Metals Division, Oct 27-31, Carter Hotel, Cleveland, Ohio.

American Society for Metals—Annual Meeting and National Metal Exposition and Congress, Oct 27-31, Public Auditorium, Cleveland, Ohio.

this instrument will give you a decided edge in every competitive situation

NIKON OPTICAL COMPARATOR

for critical inspection and measurement of high-precision parts

A small investment, in one Nikon Optical Comparator, will spell enough economies to make a marked difference in your cost-competitive position. One, it will virtually eliminate the need for expensive mechanical gages. Two, it will release trained and skilled personnel for other critical work. And three, it will generally increase the efficiency, speed and accuracy of your quality control operation.

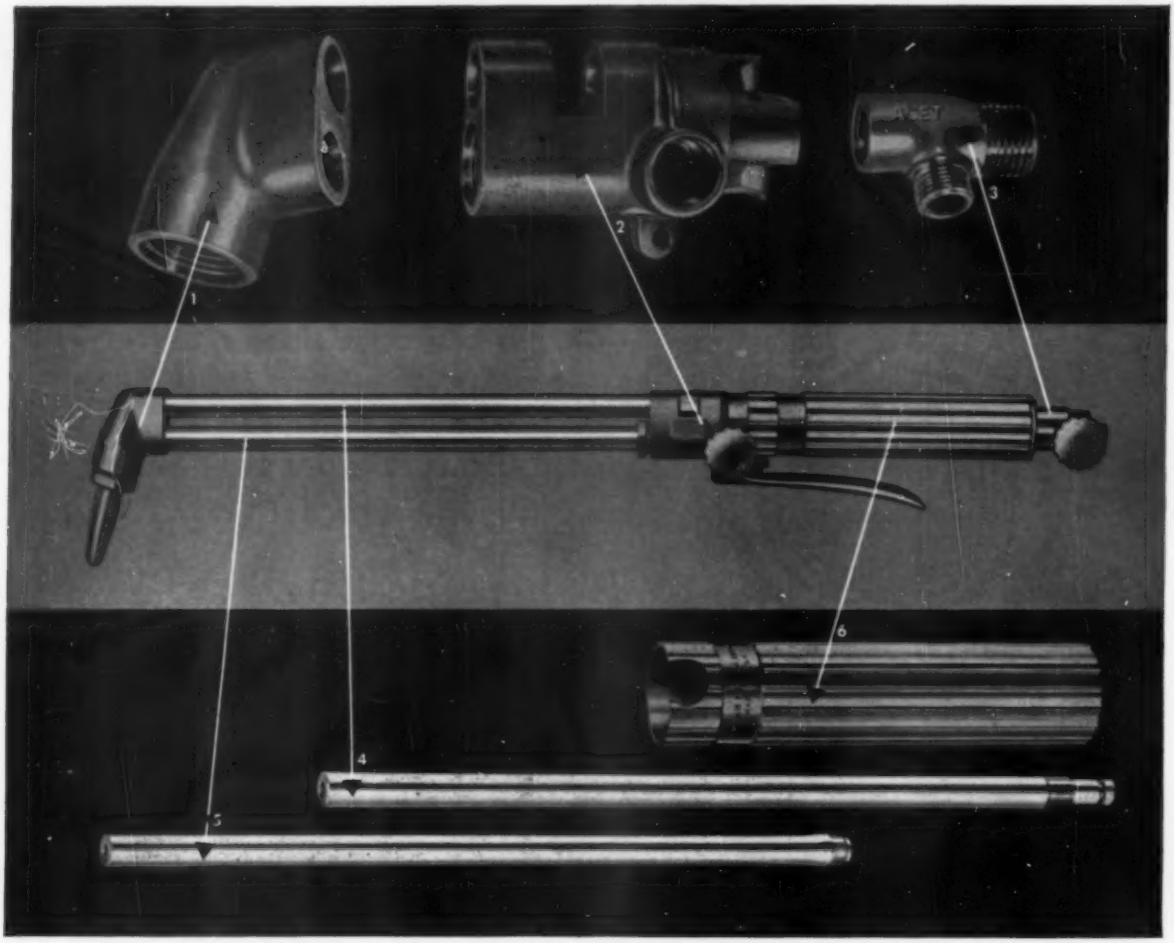
Inspection with the Nikon Optical Comparator is simply a matter of comparing the magnified image of the part under inspection with a master chart of a drawing affixed to the viewing screen. Precise measurements can be made of the most intricate contours—at a glance—by operators with comparatively little training. Further, accurate inspection of surface details and finishes can also be made. Thanks to Nikkor optics, the image is so bright and of such high resolution, that the entire inspection may be carried on in any normally well-lit room. And it can be viewed by several people at the same time.

So precise is the Nikon Comparator, that its use has enabled plants to enter into high-precision fabrication, and to achieve tolerances not available by any other methods. The Nikon Bench Model II can be easily carried from one part of the plant to another, for on the spot inspections and measurements, reducing "down time." Photo records of the image can be made in black and white or color.

It will pay you to investigate how a Nikon Optical Comparator can improve the cost-competitive picture of your organization. For complete details, write to: Nikon Incorporated, 251 Fourth Ave., New York 10, N. Y. Dept. AM-6.

SHORT CUTS to finished products.

Anaconda pre-formed mill products cut time and cost in finishing and machining—reduce scrap losses.



Linde Company's "Purox" Cutting Blowpipe, Type "E," is produced more easily and economically with these Anaconda products. **1, 2, 3.** Die-pressed forgings, with these advantages: twice-wrought metal has denseness to prevent gas leaks; toughness and strength to stand up to abuse; has uniformity, dimensional accuracy to cut machining cost—finishing reduced to bright dip. **4, 5.** Thick-wall tubes of Ambrac-850 alloy to dissipate heat rapidly, prevent overheating and "flashback"; alloy has high strength for rough service, yet has sufficient machinability. **6.** Special-shape brass tube with fluting pre-formed is furnished in long lengths ready for fast, economical screw machine operation.

Cost-cutting possibilities are almost unlimited when imagination is applied to designing with pre-formed Anaconda mill products. Simplify costly built-up assemblies with die-pressed forgings. Cut machining and scrap with tubes and solid special shapes adapted to your needs. For imaginative and practical technical help, write: The American Brass Co., Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 1340

DIE-PRESSED FORGINGS • SPECIAL-SHAPE TUBES
EXTRUSIONS • FABRICATED METAL GOODS

ANACONDA®

products made by
THE AMERICAN BRASS COMPANY

SPOT NEWS...

- **Ohio may soon have a Free Trade Zone** where foreign manufacturers of machine tools and other industrial equipment can stockpile, manufacture, display and sell their wares without paying import duties and taxes (if goods are re-exported to other nations). U S duties and taxes would be paid only on goods shipped out to U S buyers. The Zone would be the first operated by private enterprise—Stride Exchange System of Bellefontaine, Ohio. Plan will be presented for government approval soon (see p72).

- **Job finishers of sheet and strip are now setting up business** in prime metalworking centers, and steel warehousers are expected to offer the same service. The customer buys seconds, scaly HR etc, then has the material finished to proper quality specs. It's far cheaper than using cold-rolled prime material.

- **British government's raising of initial depreciation allowance** on capital goods from 10% to 30% within a week has arrested the decline in new orders for British machine tools.

- **Machine inspects production line assemblies** to make sure no concealed parts are missing. Now being used by the Army to check artillery shell fuze heads, the "Atomonitor" checks hidden parts that have previously been coated with 1/100th microcurie of radioactive silver, can inspect up to 3000 assemblies an hour.

- **Chicago is still paying more per hour to make tools and dies** than any other U S city by virtue of a new citywide three-year contract with IAM calling for a 15¢-an-hour, across-the-board increase to start immediately, a 10¢-an-hour increase next year, and another raise the start of the third year.

- **Polishing of non-pickled hot-rolled steel in sheets, coil stock** and cut strip will save two-thirds of the difference in cost of CR and HR material. Better drawing properties are foreseen, too, and work-hardening of cold-rolled will no longer be a problem.

- **Manufacturers are now liable for defective products in Michigan,** that State's Supreme Court has ruled. Case involved cinder blocks that started to "Crack, chip, pit, and explode into minute craters" a few months after they had been used in erecting a cottage. Decision refutes an English "general law" that has protected manufacturers from liability for 116 years.

- **Remote control device used in nuclear manufacturing** cuts out a piece of corroded radioactive piping, replaces it with fresh piping, welds it in two places, televises the welding operation so that work can be inspected during the process, and tests the repair with ultrasonic waves.

- **Leasing of capital goods showed a 14% gain** during the first four months of 1958 over a similar period in 1957, according to the United States Leasing Corp. Machine tools are still the most-leased items, but leasing of cranes, electrical apparatus and communication systems is growing fast.

- **Look for another drive by Russia to increase machine tool output.** All essential machinery parts produced in Communist countries will be standardized, duplicating production in Red Bloc countries will be eliminated, and R & D work will be closely coordinated between nations.

Spot index to major News stories...

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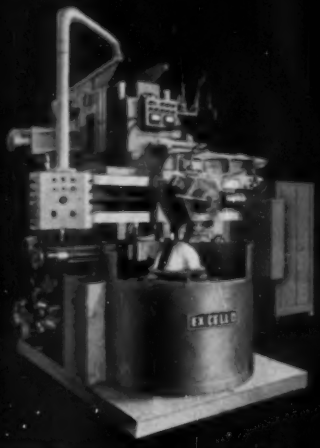
XLO

EX-CELL-O FOR PRECISION

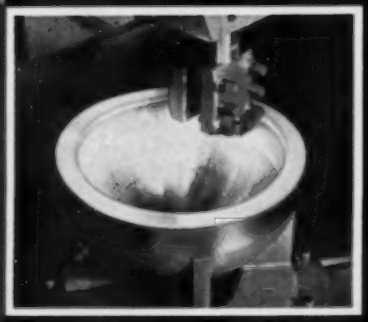
LEFT: Single tracer-controlled tool contours aluminum forging to .080" wall thickness holding .001" tolerance inside and outside.



ABOVE: Compact Vertical Contouring Machine handles medium or large workpieces. Slim cabinet at right side holds electronic tracer controls.

Critical Contour Tolerances?

HOLDS WITHIN .001" OF TRUE CONTOUR—INSIDE AND OUT



Close-up shows Style 416 contouring the inside surface. Workpiece is held in a vacuum fixture mounted on the machine table.

58-7

Contouring within .001" of true contour—inside and out—*without waste* requires the kind of precision built into an Ex-Cell-O Style 416 Vertical Contouring Machine.

The aluminum forging illustrated was first contoured on its periphery with a single electronic-tracer-controlled tool, then precision-finished inside to .080" wall thickness.

Designed for contouring hemispherical or irregularly-shaped surfaces, Ex-Cell-O Style 416 Machines also face, bore, turn, groove and chamfer with automatic cycling between loading and unloading.

Call your local Ex-Cell-O Representative, or write directly to Ex-Cell-O for information on other Precision Vertical Boring Machines.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

WASHINGTON...

Renegotiation...

. . . of defense contracts is up for renewal again, and Congress seems in a mood to extend its life.

The administration is in favor of the extension of the program for another two years. If an extender isn't passed, the authority to renegotiate expires December 31.

Industry representatives are trying to get amendments that would eliminate some of the hardships they find in the present law. Primarily, they're behind new ground rules on recapture of profits earned under incentive contracts, sometimes as long as four years after payments are made.

However, renegotiation officials are taking a firm position against any exemptions for incentive contracts. They contend that this would eliminate many of the contracts now held by the aircraft industry. In fact, incentive contracts commonly govern the big dollar volume business of the Pentagon. Hence, renegotiation officials say that removing incentive contracts would be almost the same as having no law at all.

Figures covering the latest full year of renegotiation, submitted by the Board, claim that some $431 million was recovered by the government via renegotiation that would not have been recovered otherwise.

Contractors claim that actually the price revision processes of the Pentagon are enough to wring the excessive profits out of their business.

New labor bill...

Big labor, meaning the AFL-CIO, has quietly thrown its support behind mild union reform legislation. Whether this will be enough to get anything accomplished in the House of Representatives at this session is one of the intriguing questions current in the Capital. A lot of backstage politicking is going on.

These are the considerations: The House Democratic leadership, under Speaker Sam Rayburn, is becoming convinced that Republicans can make hay with the issue of softness on labor corruption—that is, unless the House now acts on the Kennedy-Ives Labor Reform Bill that has passed the Senate. Chairman Graham Barden and the House Labor Committee are being put under pressure to reverse their earlier stand, which was to do nothing about general labor legislation this session.

Biggest news is that the AFL-CIO, fearing much tougher legislation if the issue is left to lie until next year, is quietly at work in behalf of the moderate Kennedy-Ives Bill, which wouldn't much interfere with the workings of most unions. Its major provisions: public disclosure of union finances, regulation of labor consultants and other "middlemen," and election by secret ballot of national and local union officers.

Hot cargo...

Labor unions may bargain for "hot cargo" clauses in their contracts and even urge employers to engage in a boycott without violating the Taft-Hartley Act.

But a union is guilty of illegal secondary boycott activity if it directly appeals to employees to enforce a hot cargo contract.

That's the ruling of the U S Supreme Court in three test cases. It leaves the controversial issue where it was in 1954, when the National Labor Relations Board first took the same stand. The Court refused to support later NLRB decisions, which take a tougher stand against hot cargo.

Auto optimism...

. . . can be heard in Washington, and from people who should know something about the outlook. One expert who follows autos closely says his private opinion is that sales will be up next year—between 5 and 6 million.

One angle that carries weight with some officials is that auto companies don't want to say just how good they feel 1959 will be, for fear that consumers might cut their buying even further and await the next year's models.

Among the reasons listed to support contentions that next year will find autos giving the rest of the economy a boost:

- Consumer confidence will pick up, and there'll be less hesitation about taking on new debt;
- Those who paid off their auto loans this year will be ripe when the '59 models come out; and
- 3 to 4 million cars that will be junked will have to be replaced.

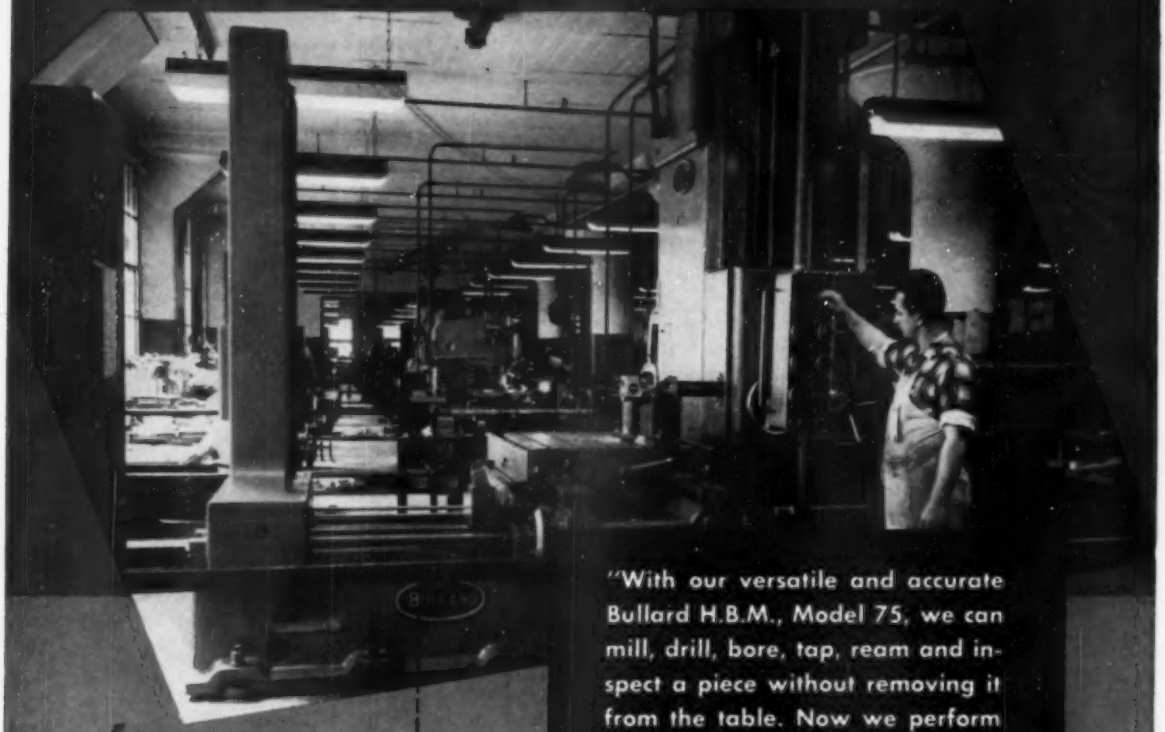
Steel prices...

. . . shouldn't go up this summer, says Senator Kefauver. He's been trying to keep them from rising by applying the needle to the administration in speeches on the Senate floor.

Kefauver says that hearings by his Antitrust and Monopoly Subcommittee reveal that the industry's "administered prices" show that price increases in July, 1957, were at least twice the amount necessary to cover increased wages.

PROFIT DEVELOPMENT ... is important!

"We discovered," reports the Mergenthaler Linotype Co., "that a Bullard H.B.M., Model 75 saves us valuable time. It eliminates much of the waiting and handling time previously used in the fabrication of jigs, fixtures and special parts."



"With our versatile and accurate Bullard H.B.M., Model 75, we can mill, drill, bore, tap, ream and inspect a piece without removing it from the table. Now we perform as many operations as possible on the same machine."

The Dav-a-matic, world's first automatic, all-purpose offset duplicator, is produced by Mergenthaler Linotype Co. with the help of its 3" Bullard H.B.M., Model 75.

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Remember . . . to cut costs when cutting metal — buy Bullard

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DETROIT...

Production forecast...

During the first six months of 1958 approximately 2.2-million passenger cars were built, a pace nearly one-third under last year's production. A 4.3-million forecast for the year seems firm. Of the remaining 2.1-million cars to be built about 1,620,000 will be 1959 models. The latter figure includes 20% of third quarter production and all for the fourth quarter.

On the bright side of 1959 chances is the fact that dealers may actually experience a shortage of cars during the changeover period. Good used car supplies are already at their lowest level in years. This will stimulate high trading.

Through the keyhole...

In addition to warnings by letter, General Motors is distributing to key suppliers posters showing a worker with a large cork in his mouth. The caption reads: "Plug that leak—loose talk hurts us all." Most active disburser is Chevrolet, worried about its sieve-like small car security.

So turning to Ford, we learn that bid invitations on its small car tooling started to dribble out in mid-June. What has been seen doesn't indicate the type of engine and drive. The Ford design has been strongly rumored to include front-wheel-drive. Meanwhile, Chevrolet is proceeding on schedule with its "Domestic Holden."

Hi-Fi ignition...

The Electric Auto-Lite Company has the ignition system of the future installed in at least four experimental cars that are sitting in the parking lot of its Toledo, Ohio, research laboratories. Only catch is that Detroit is behind schedule in needing it. The system is designed for engines of 12-to-1-and-above compression ratios. Current engines don't need it. With the horsepower race currently running at turtle pace, the development lies dormant. Automakers can't justify the reasonable extra cost.

It consists, for the electronically minded, of a transistorized oscillator specially designed to incorporate circuits providing stability of operation and instantaneous starting; a step-up transformer; a high-peak, inverse voltage rectifier; an oil-filled discharge capacitor; a rotary-gap distributor with rare metal contact points; and unique spark plugs that surface discharge through a semi-conductor.

Vacuum and mechanical advance devices of various types are under test. Basic timing is fixed mechanically in the conventional manner. Transducers at each cylinder could be substituted for the cylinder to pick up the when-to-fire impulse.

The experimental units have been tested for thousands of miles and have performed with superior reliability. Spark plug life has been extended to 30,000 miles and in other respects, the system would last the life of the car.

Though transitorized ignition won't be publicly available in 1959 or even 1961, transistorized voltage regulators with a matching alternating current rectifier (as a lightweight substitute for a heavy-duty generator) will. Delco-Remy will plug this as an option on 1959-model GM cars.

Willys abroad...

Willys spokesmen will not comment further on wire service reports that the company is discussing a "mutual cooperation" pact with England's Rover car company. Even though President Edgar Kaiser has acknowledged that talks are in progress, observers here question the reason. Rover, outside of producing small luxury cars and solidly pioneering in gas turbine research, is noted mainly as the manufacturer of cross-country, all-wheel-drive vehicle competitive in world markets to Willys' Jeep.

Meanwhile, Willys is still investigating possibilities of producing on its own the Aero model passenger car in Brazil, despite Chrysler's unexpected exit from the picture. No decision has been reached.

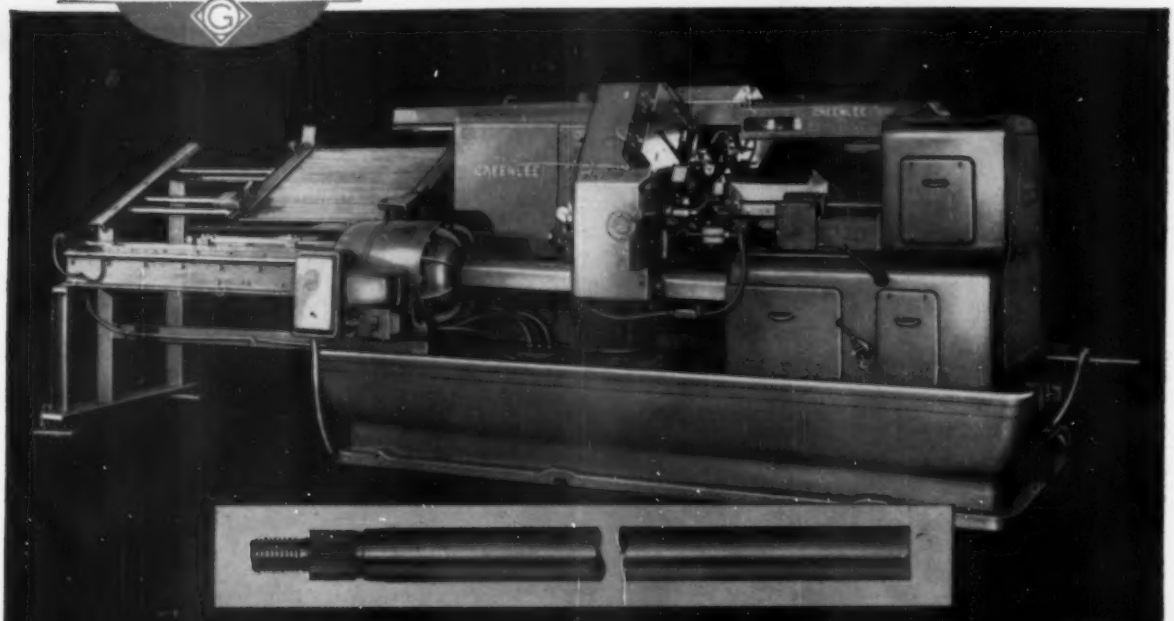
Further investigations involve civilian possibilities for the "Mechanical Mule," a powered load-carrying platform designed to be "led" by a foot-borne driver. The Ordnance Corps places no restriction on adaptations of basic military designs even though it paid for the tooling. But Willys engineers point out that extensive rework would be necessary. They visualize the mule in civvies mainly as a baggage carrier at railroad and airline terminals, or performing a similar function in warehouses and factories. This would eliminate the need for expensive, off-road traction features.

Trailer down under...

New South Wales' Premier J J Cahill flew to Detroit recently to join Roy Fruehauf in announcing formation of Fruehauf Trailers (Australasia) Pty, Ltd. The new firm is a joint venture of Clyde Industries Ltd, Sydney, which with Fruehauf will utilize Clyde's 1-million-sq-ft of manufacturing facilities. Production before the end of the year is expected to reach 100 heavy-duty, over-the-road units monthly.

PRODUCTION MACHINERY

GREENLEE SHAFT MACHINES



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GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
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- Hydro-Borer Precision Boring Machines

HANDLE PRECUT SHAFTS UP TO 60" LENGTH

Simultaneous magazine loading and automatic ejection in one position pay off in the machining cycle. Standard tools machine shafts through the five remaining positions.

Special fourth position turning, facing or drilling operations can be performed on the back end of shafts long enough to extend past the back of the spindle. These operations occur simultaneously with normal front end machining.

For greater accuracy, faster setup and production on your long shaft jobs, this Greenlee is the answer! Get the full story from your Greenlee representative.

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first step on the way to more profitable production
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AIRCRAFT and MISSILES... TRENDS

No job pickup in sight...

Four major California aircraft and missile manufacturers report their total employment figures will continue to drop for some months to come. They see no significant pickup in employment much before late 1959.

North American Aviation, for instance, intends to drop some 3000 workers between now and the end of August as its fighter programs phase out.

Two major programs are in the offing—the F-108 and the B-70—but money has not yet been committed for these projects and production lines won't be organized for at least a year, possibly a year-and-a-half. Current NAA backlog is $515 million, but a go-ahead order on the F-108 and B-70 could boost it to $1.1 billion.

Northrop is continuing to reduce its employment rolls by attrition. Workforce today is 20,500, compared with a peak of 24,000 a year ago—and further reductions are continuing.

About 60% of Northrop's total program is in manned aircraft and missiles, including the Snark SM-52 ICBM. A substantial portion of Northrop's business is in subcontract work for aircraft structural assemblies for the Boeing KC-135 jet tanker and 707 jet transport.

Brightest spot on Northrop's horizon is the T-38 supersonic jet trainer it is developing for the Air Force. It'll fly late in '58 or in early '59.

Lockheed is still gathering figures on its employment situation, but even without such figures it's evident that total employment will decline still further—although the company will continue to hire people for its missile program. Douglas is in the process of laying off, and will do so until the end of the year. Reason is that Douglas employment peaked while it was delivering 15 or 16 commercial aircraft a month. But as the company approaches the end of its commercial contracts for DC-6s and DC-7s, the rate of delivery has diminished.

Douglas missile sales, however, are up sharply from 1957, and a recent order for 15 C-133 military transports extends production into 1961.

Douglas' last backlog figure (in February) was $1,638,000,000. But the company has been delivering against this backlog, so today's figure should be somewhat less.

A Man-In-Space...

. . . project is being pushed vigorously by the Air Force. It is already putting pilots through a gruelling series of simulated space flights to be made by the highly-touted X-15—which will be in effect a forerunner of the Air Force's Dyna-Soar projects.

The X-15 won't orbit. It's a joint Air Force-Navy-NACA research affair with Air Force to do the flying, Navy doing the space medicine involved, and NACA doing the design. Object is to use the planes—three of which are being built by North American Aviation—to collect test data after being launched from a B-52 bomber.

Drop tests are slated for this fall, glide tests for January, 1959, and the first real flight by April of next year.

Dyna-Soar contracts...

. . . Have been awarded to Martin and Boeing. It's estimated that it will cost about $150 million, all told, to put into orbit this manned satellite that will be able to skip its way back into the earth's atmosphere the way a flat stone skips on the water. Air Force and NACA are jointly directing the work.

Martin and Boeing will compete on the development of the craft—much as the Air Force-Douglas Thor competed with the Army-Chrysler Jupiter to be chosen as the military's IRBM.

Tartar system to Puget Sound...

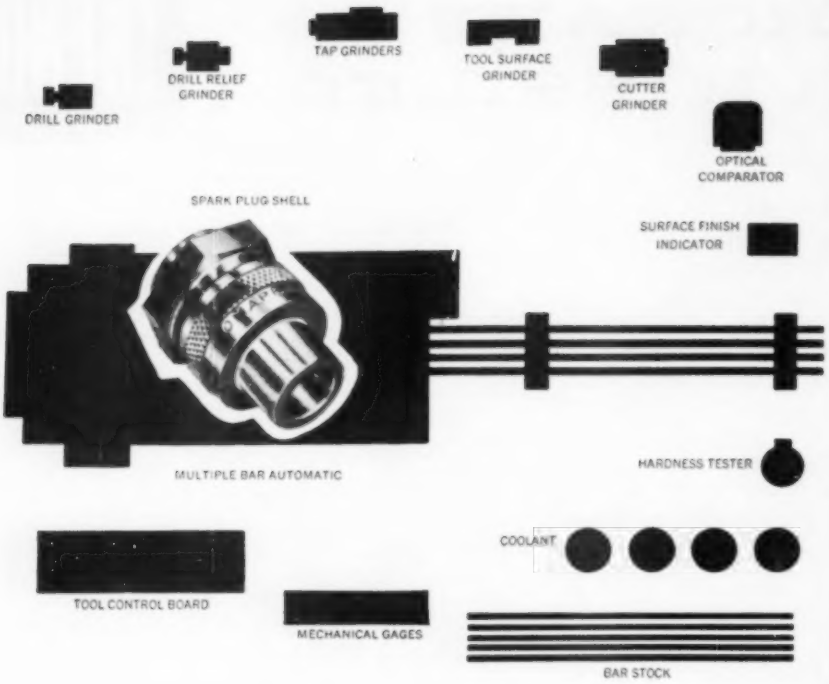
Puget Sound Naval Shipyard has been allocated a $12-million project by Navy to develop and manufacture a shipboard launching system for the Tartar missile. This is the fourth such system to be awarded Puget Sound. Others were for the Terrier, Talos and RAT missiles.

Assisting in design will be C W Smith Co, Detroit; Kirk Engineering Co, Los Angeles; Hill & Ingman, Seattle, Harper Engineering, Santa Monica, Calif.

Special sections of the launching system will be turned out by Western Gear Works, Seattle, and Naval depots at Keyport, Wash; Louisville, Ky; and Pocatello, Idaho.

N/C builds wind tunnel models...

Tape-controlled machines are cutting 90% off lead-time in building wind tunnel models at Convair-San Diego. First model, a 1/20-scale job, was created with a digital computer, a numerical control director, and a Giddings & Lewis profiler, capable of cutting compounds within limitations of three axes. Under this system, a model making project takes 200 hours or less, contrasted with 2000 hours by former methods.



Are your cost conditions optimum?

(If not, you will want to read this announcement)

Only optimum conditions can bring about the lowest possible machining costs. In agreement with this, 17 manufacturers (see list at right) have agreed to coordinate their interests in the establishment of a Cooperative Machining Project to determine optimum conditions for the use of multiple bar Conomatics.

Six basic factors (see column at right) and many sub-factors comprise the "conditions" of any machining performance. The qualities, responsibilities, and coordination of these can vary from plant to plant. And, as they vary, so will machining costs.

As representative of quality products and services to the machine user, this group will select work components* across industry that are representative of great volume, popular grades of steel, and commonly used tool combinations.

Each job will be thoroughly analyzed and developed to arrive at the best conditions for the lowest cost results. Simulated production runs will then be made to determine the actual cost per piece. With exception of those retained for samples, all work pieces will be returned to the steel mill along with the chips.

This non-profit project is housed in an enclosed area in one section of the Cone plant. Without obligation, work results will be available to any "automatic" user, interested in machining costs. Please address all inquiries to the Comapro Dept.

*spark plug shell illustrated now under development

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VERMONT, U.S.A.

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Jones & Laughlin Steel Corp.
Joseph T. Ryerson & Sons, Inc.

Grade Identity • Machineability
Machineability Uniformity
Hardness Uniformity
Adherence to Chemical and Physical Specs
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Smoothness of Finish
Squareness of Chamfered Ends
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Uniformity of Lengths

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Black Diamond Saw and Machine Works, Inc.
The Cleveland Twist Drill Co.
Firth Sterling, Inc.
Jones & Lamson Machine Co. (Thread Tool Division)
Royal Oak Tool and Machine Co.
Scully-Jones and Co.

Perishable Tool Material
Adherence to Hardness Specs
Adherence to Accepted Design
Suitability to Work Requirements
Tool Holder Interchangeability
Holder Adaptability to Perishable Tool Replacement and Job Changeover

MEASUREMENT CONTROL

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Federal Products Corporation
Jones & Lamson Machine Co. (Comparator Division)
Scully-Jones and Co.
Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.

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Setting Control of Tools
Machine Accuracies

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Responsible Inspection of Qualities and Measurable Properties of All Factors
Optimum Condition Machining Manuals for Various Personnel Levels

MATERIALS... TRENDS

Transistor marks a decade...

On June 30, 1948 Bell Telephone Laboratories announced, for the first time publicly, the invention of a new device operating on an entirely new principle . . . an electrical amplifier . . . that would do just about anything a vacuum tube would do and in addition had unique advantages not possessed by vacuum tubes. This was the birth of the transistor.

In a single decade, growth of this device from a laboratory sample to commercial production has been remarkable—phenomenal in recent years. Even with the exacting standards of purity and cleanliness required in manufacturing, transistor production for commercial use has jumped from 1.3 million units in 1954 to about 30 million units in 1957. This number, added to a total of 60 million semi-conductor diodes sold in 1957, yielded a sales volume in excess of $100 million. And the volume is rapidly rising.

Dr Mervin J Kelly, president of Bell Telephone Laboratories, predicted that in 1965 the dollar volume of transistor and semi-conductor diode sales will be greater than that of electron tubes; that by 1975 semi-conductors will serve in 90% of electronic devices, and vacuum tubes in the remaining 10%.

New demands on metalworking...

Semi-conductors, so far, are primarily provided by two elements—germanium and silicon. Each has a different set of characteristics, good and bad, to meet special requirements. For example, silicon will operate at higher temperatures while germanium is sensitive to shorter wavelengths.

But these are only two materials of the literally hundreds of potentially useful semi-conductors. For example, theory suggests that two intermetallic compounds, indium phosphide and gallium arsenide, should operate to higher temperatures (and/or powers), perhaps to 400 C, and still provide for higher frequencies and broader band widths as used with today's structures and techniques.

Working with these new materials is one of the critical problems. Transistor materials must be sliced from "giant" crystals of germanium and silicon. The essence of transistor electronics has been the search for understanding and control of minute impurities in these otherwise perfect crystals. Cleanliness in manufacturing is a paramount requirement. Even now manufacturing requires special equipment and great care. As further miniaturization is done new concepts of metalworking must evolve.

Heating element for 3090 F...

A new Mosilit metal-powder, resistance-heating element manufactured by Cesiwid GMBH, a subsidiary of Siemens-Plania Werke, Meitingen, is said to operate efficiently in air at temperatures up to 3090 F without any protective atmosphere.

Made of molybdenum silicide, the material automatically forms an SiO_2 shield as the current begins to flow. The high specific electrical resistance (about 385 ohms psi per ft) at 2900 F is said to be maintained constant until complete element exhaustion.

More on cans...

"We hear a lot these days about aluminum as a can-making material and a possible substitute for tinplate. Considering such a possibility, the equipment in this new coil mill *can be used just as effectively for aluminum as for tin mill products.* On the subject of aluminum, however, I feel it is fair to say that until the aluminum industry is able to revise its price structure so as to be fully competitive with steel, the price of aluminum will be its greatest obstacle to becoming an important can-making material. At the present moment the aluminum industry appears to be making great strides toward overcoming that obstacle. This in itself should serve notice on the steel industry that it cannot become smug or complacent about its present position." This is the opinion of William C Stolk, president of American Can Co, expressed at the opening of his company's new coil-stock plant in Hammond, Ind.

Iron-aluminum not ideal...

It is unlikely that Fe-Al or Fe-Cr-Al base alloys can compete at present with straight chromium stainless steels in applications requiring only resistance to atmospheric corrosion. However, a chromium shortage probably would give these materials advantages in the areas of price and availability. In high-temperature service, their oxidation resistance recommends them for immediate use where high-temperature strength is also a requirement.

In a paper presented by King, Mueller, Ida, and Tate of The Martin Co, at the SAE Summer Meeting in Atlantic City, the authors went on to conclude that presently developed alloys can be used to clad high-hot-strength materials and that a great need exists for more data on the metallurgical peculiarities of the Iron-Aluminum system.

How to avoid alloy steel failures

Ordinary precautions may protect you most of the time. But your luck could run out—and a single alloy steel failure can result in serious loss.

That's why the *extra* precautions of the Ryerson Certified Alloy Steel Plan are important to you. Under this plan you know three vital facts about the alloy steel you order from Ryerson stock:

- **Heat identification** . . . not just type identification, but the positive identification of your particular heat of alloy which has been spark-tested and separately racked to eliminate the possibility of mixed steels.
- **Chemical analysis** . . . not just the chemical range for the type, but the specific analysis of the heat from which your steel was rolled—keyed to your steel's identification.
- **Hardenability** . . . not just the average hardenability for the type of alloy, but the actual test-proved hardenability of your particular heat of steel, as-quenched and at three draw temperatures.

As a result, you can be sure of the steel you get from Ryerson—sure of what it will do . . . and sure of how to heat-treat for desired properties.

This extra protection is yours at no extra cost. So call your nearby Ryerson plant for every alloy steel requirement—and be sure.

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RYERSON STEEL®

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MACHINE TOOLS...

Soviet seeking Western orders...

Lathes, milling machines, boring machines and gear cutters are among the Russian machine tools now actively being sold in Western Europe.

Prices are said to be "based on the market and mostly above Moscow's international accountancy price." But if the Russians want to start serious competition, they can cut prices deeply.

Russian sales agents must consult Moscow if a customer wants advanced types of machines, such as those with electronic controls.

Various key spare parts are reported to be delivered with each new Russian machine. Replacement parts are claimed to be supplied promptly on special order to Moscow.

An air mail order has resulted in delivery of a replacement item in Belgium within 10 days.

An order for a 140-ton Russian boring mill is now being negotiated for a western European customer. One mill about to be delivered is said to be a carbon copy of a Schiess mill of three years ago, but some improvements have been made.

Red Proletariat Works at Moscow is reported to be building 800 lathes of one model a month. They are assembled on a traveling conveyor.

Another Soviet factory is building five models of milling machines containing a large number of components. Monthly output is 1000 units.

Sales conference at Purdue...

The 1958 Machine Tool Sales Conference will be held July 28 to August 1 at Purdue University, Purdue, Ind. Attendance is open to employees of members of the National Machine Tool Builders' Association and of the American Machine Tool Distributors' Association, which are co-sponsors of the conference.

Lester M Cole, vice president of sales Warner & Swasey Co, is chairman of the conference. Professor Harry J Loberg of Cornell will be the educational director, and Professor O D Lascoe of Purdue will have charge of arrangements at Purdue. Most of the faculty will consist of machine tool builders and distributors. They will be supplemented by members of the faculties of Cornell, Dartmouth, Purdue and Western Reserve. Students will live at the Union Club of the Purdue Memorial Union.

Battle over modernization funds...

Advocates of legislation to create a revolving fund from which the services will finance the modernization of their production equipment have been pushing hard for action. This fund would come from machine rentals derived from government-owned machines on loan to industry under the proposed uniform leasing procedure endorsed by a government inter-agency commission chairmanned by the Office of Defense Mobilization.

Senate Bill 2595, known as the Sparkman Bill, creates such a revolving fund. A similar bill HR 10830, is before the House and is sponsored by Representative Reuss.

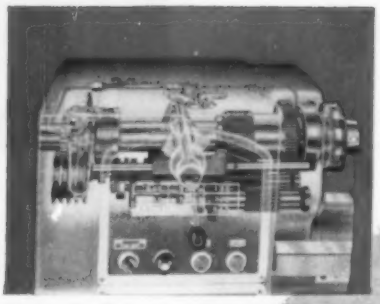
Department of Defense has been steadfastly opposed to the plan from the beginning and still is. It contends that the nation's taxpayers derive more good from continuing the practice of the armed services of getting lower prices on final military products as an offset against rentals than having contractors pay cash rentals into the government's coffers.

High-speeding machining shown...

Machining of 1045 steel at 5000 fpm with Carboloy cemented oxide was demonstrated at a machine and cutting tool show held this month by A J Rod Co Inc, Houston, Tex. This high cutting rate is the result of development in ceramic tools. Production grinding also was shown, with tolerances held to 0.0002 in. Contour-turning of 3140 tool steel was done to tolerances of 0.001 in.

B.F.

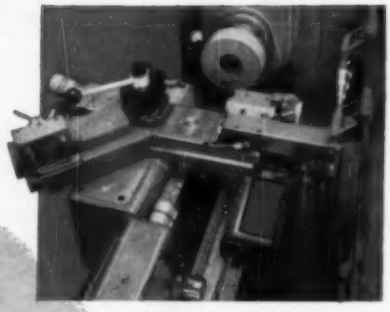
New new orders for cutting and forming machine tools remained almost exactly at April levels ($28,250,000) in May ($28,050,000), but shipments decreased from April's $51,200,000 to $50,350,000 in May on the National Machine Tool Builders' Association Index



Full 5 HP—all spur gears—anti-friction bearings—automatic filtered lubrication—9 spindle speeds to 3000 RPM.

BIG

lathe features at low cost!



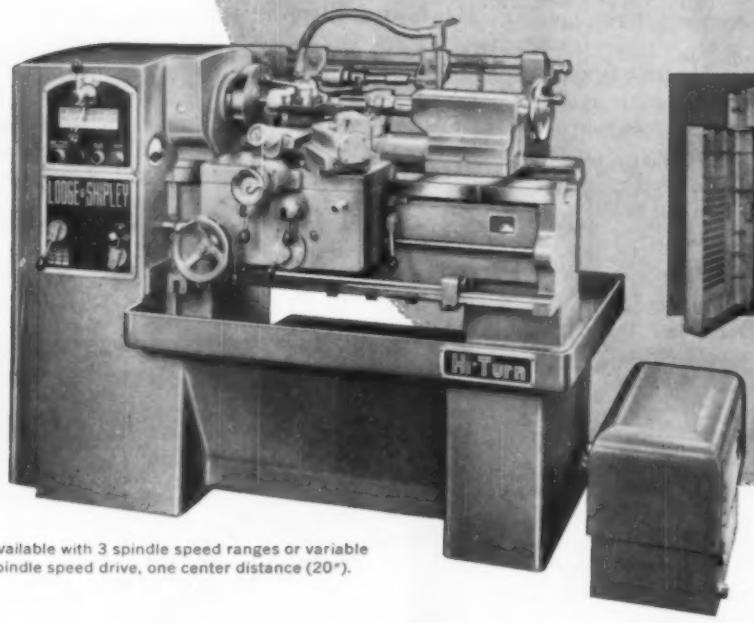
Compact, efficient 45° tracing mechanism—trouble-free, exclusive Lodge & Shipley design.

why pay $20,000 when you can buy a LODGE & SHIPLEY 1307 (10")

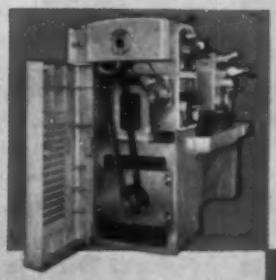
Template-type multiple length stops for duplicating shoulder lengths.

Hi-Turn COPYMATIC

TRACER LATHE for less than $10,000?



Available with 3 spindle speed ranges or variable spindle speed drive, one center distance (20").



Easily accessible and adjustable drive with Dinabrake motor.

Simple set-up for contour facing operations.

The **HI-TURN 45° COPYMATIC Tracer Lathe** is extremely rugged, built to do production jobs at time and money-saving rates. You get Lodge & Shipley quality features at a price substantially below many lathes having less horsepower and light construction. If you perform manufacturing or tracer lathe operations, put them on a lathe built to do the job at lowest cost. The features shown here are but a few of many . . . for complete details, request Bulletin DM-4 from:

The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio

WHAT'S AHEAD... in Metalworking

TRENDS

Again, a time of paradox...

These are the times that try the souls of economists and the predictors of things to come in industry. For instance, the Metalworking production curve has taken an upturn for the first time in more months than we care to think about. And metalworking prices have at last halted their years-long rise.

Automobile production has shown something of a late spring upsurge, and another long-depressed area of metalworking—appliance production—is coming to life. Farm equipment output is on the rise, too.

Even steel production, which just a few short weeks ago bottomed out in some areas at 25% of capacity, has risen fast in the last few weeks.

But it's a question whether the steel buying market is getting healthier, or whether plants are merely laying in a good supply before an anticipated price rise this summer.

Too, steel operating rates are based on ingot production, which right now is running ahead of shipments—mainly because mills in recent months have radically reduced ingot inventory and are now replenishing it. This could be the mills' way of doing a little price hedging before a wage increase goes into effect July 1.

Thus on the surface industry today seems to be snapping out of the recession, but spot checks of bellwether segments of metalworking apparently contradict this rosy picture.

Capital goods, for instance, have the government's top economists baffled (see p71). They cannot seem to agree whether or not the extremely heavy first-quarter slash in plant and equipment sales is still going on.

Tool and die business posted steady gains from December through March, then fell of sharply in April (20% from March levels). Since then, those shops closely geared to the appliance business have shown a pickup, but others dependent upon automotive orders report nothing much is doing in that sector as yet.

A combination of rising shipments and falling orders on the tool and die industry has cut backlogs to shreds. Today, they're something like 45% below year-ago levels.

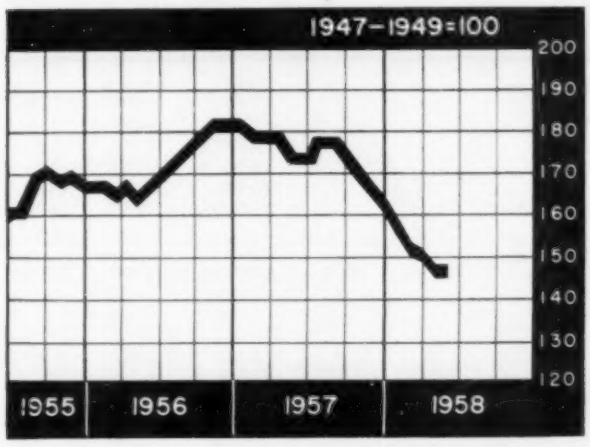
Cutting tool outlook, generally regarded among metalworking men as a harbinger of things to come, isn't at all rosy. Sales today are down 10% or so from three-months-ago levels, and 40% from June 1957 totals.

Carbide and carbide-tipped cutting tools are moving very slowly—down 20% from three months ago, and down 52% from a year ago.

Screw machine products business is down 35% from year ago levels, shows no signs of improvement. Stamping shops allied with the appliance industry report a slight upturn in recent weeks, but those geared to auto output report very slow business.

Foundry output is in the doldrums—especially gray iron. More than 100 GI foundries have folded already this year, contrasted with only 90 in all of 1957. Output is currently running at about 30% or less of maximum demand.

Steel foundries report that business continues to drop off from a dismal 35% of maximum demand in May to an even-more-dismal 32% in June. New orders have firmed up some, but at a low 30% level.



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AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

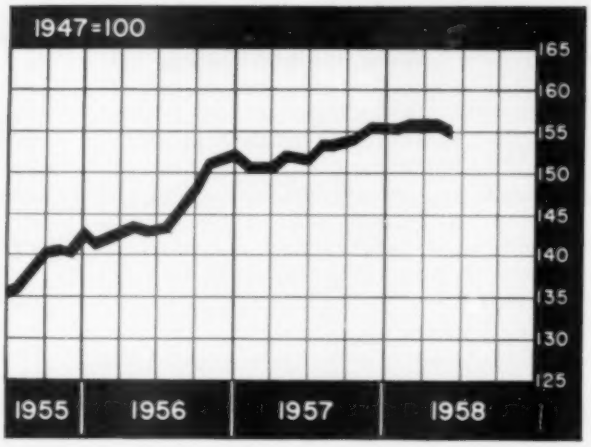
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JUNE Estimated	MAY Preliminary	APR. Revised	MAY Year Ago
Total Index	**148**	**148**	**146**	**175**
Machinery	122	123	152	
Electrical Machinery	169	166	199	
Autos	90	86	127	
Other Transportation	346	336	371	
Other Metalworking	128	128	142	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JUNE Esti-mated	MAY Pre-liminary	APR. Re-vised	MAY Year Ago
Total Index	**155.8**	**155.9**	**155.9**	**151.9**
Metalworking Machinery		**182.3**	**182.3**	**176.9**
Other Machinery exc. Electrical		**165.8**	**166.1**	**160.6**
Electrical Machinery		**158.1**	**158.0**	**154.3**
Fabricated Metal Products		**146.4**	**146.4**	**143.3**



Economy on the upswing again...

Key indicators are again pointing upward as the evidence mounts that the economy is pulling out of the decline. But the likelihood that some of these indicators may temporarily backslide, combined with a sobering report on the capital spending picture, requires that recent cheering news be treated with caution. Business will be moving on a plateau in the next few months—and a bumpy plateau, at that.

Here are the highlights from the latest batch of encouraging economic communiques:

After an uninterrupted eight months' slide, industrial production, as measured by the Federal Reserve index, turned up in May—to 127 from 126 in April.

The number of jobless dropped below 5,000,000 for the first time since January. Employment increased from just under 63,000,000 in April to just over 64,000,000 in May.

In line with the May pickup in employment, the wages and salaries component of personal income advanced for the first time since August.

Private housing started in May exceeded the million a year rate for the first time since January. On the less encouraging side:

Business outlays on new plant and equipment, according to the latest government report, are expected to total only $30.8 billion in 1958—over $1 billion less than had been forecast earlier this year. The 1957 figure was $37 billion. Expenditures will decline steadily through the year, falling below $30 billion, annual rate, in the final quarter. However, the steepest part of the drop appears to be behind us.

Industrial production may slip a bit again this summer. Many industries—notably the auto industry—are planning longer than usual vacation shutdowns.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	132.1	129.6	146.7
Steel ingot operation (thousands of tons)	1,737	1,728	2,181
Electric power output (million Kilowatt hours)	12,109	11,681	11,958
Production of automobiles and trucks	107,068	97,877	156,223
Engineering construction awards (Eng. News-Record—millions)	$429.9	$505.5	$370.8

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	127	126	144
Index of durable manufactures production (1947-1949=100)*	134	132	160
Durable goods manufacturers' sales, millions*	$11,504	$11,670	$14,254
Machinery manufacturers' sales, millions*	$ 3,785	$ 3,685	$ 4,242
Durable goods manufacturers new orders, millions	$10,640	$11,488	$13,234
Machinery manufacturers' new orders, millions	$ 3,551	$ 3,511	$ 3,850
New orders for nonelectrical machinery (1950=100)*	135	120	142
New contracts for industrial construction (1950=100)*	79	89	122

* Seasonally adjusted

VERS-O-TOOL cuts 10.3 miles of thread per grind on this job . . .

The Federal Screw Works had a real problem in threading. They had received a large order for 1"x13" adjusting screws. Using most thread cutting methods this would be a big, costly assignment.

Federal put a Namco 1⅝" DR Vers-o-Tool on the job and as a result, found they had to grind the chasers only once for approximately 2000 pieces. This means that each grind cuts well over 10 linear miles of thread. Threading cost per piece was amazingly low.

Remember, Vers-o-Tools can be used with your present turning equipment, lathes, drill presses or automatics. No investment in special machines required.

Find out how you can put Vers-o-Tools to work reducing your thread cutting costs. Write for a free copy of Booklet DT-52.

You can grind and regrind Vers-o-Tool circular chasers to a full 270° of the chaser circumference.

In addition to thread cutting, Vers-o-tools may be used for end forming, end turning, chamfering, necking, knurling and burnishing.

National Acme

THE NATIONAL ACME COMPANY, 171 E. 131st St., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

CLIMB MILL with SAFETY

in either direction . . . to FULL OVERLOAD CAPACITY

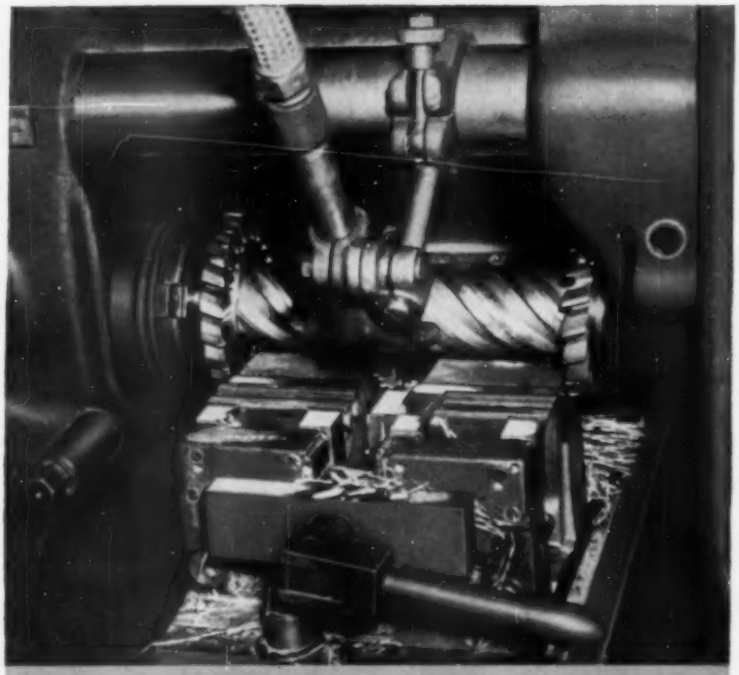
BROWN & SHARPE
No. 12 Plain Milling Machine
table drive design

ELIMINATES
feed screw
BACKLASH

The backlash eliminator mechanism in the No. 12 provides safe and certain control through exclusive features designed by B&S to overcome disadvantages of similar mechanisms. Its operation is simple, and is actuated by the automatic separation of the two members of a double nut, the rotation of which drives the non-rotating table screw longitudinally.

NO "DRAG" ON TABLE SCREW IN FAST TRAVERSE

The blacklash eliminator mechanism is released automatically when the table moves at fast travel, — preventing wear, and permitting automatic cycle operation with full efficiency.



With no backlash problem, you can plan milling set-ups to take full advantage of the extra high cutting loads now practicable with B&S high speed or NELCO carbide cutters.

Permits full use of automatic milling cycles

Since climb milling in either direction is completely practicable, full utilization can be made of the wide variety of time-saving milling cycles provided by the B&S No. 12.

Permits efficient milling of pieces difficult to hold

In climb milling, the cutter exerts a downward pressure which seats the work more firmly in the holding device. Thin, narrow, or irregular-shaped pieces can be climb milled without difficulty, in simple fixtures.

With backlash eliminated, you can also take heavier cuts in conventional milling. Cuts can be made at faster feeds without chatter — with no sacrifice of surface quality, and with much longer cutter life.

Compare the all-around performance of the No. 12 with similar production type milling machines. You'll see why the Brown & Sharpe designed backlash eliminator, with many other advantages, makes the No. 12 your best investment . . . for productivity and unlimited adaptability. For complete information, write: Brown & Sharpe Mfg. Co., Providence 1, R. I.

For extra versatility in production milling cycles

***SPINDLE POWER FEED ARRANGEMENT**

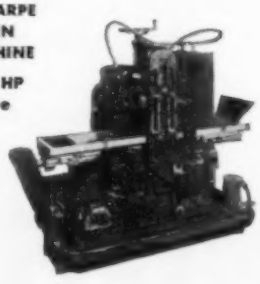
Permits many milling cycles that require the accurate lowering and raising of the machine spindle in conjunction with table movements.

***SPINDLE HEAD RAISING ARRANGEMENT**

Can be set to raise cutter automatically — to prevent marking milled surface during table return — or to clear obstruction between two cuts of same depth.

***OPTIONAL at extra cost**

BROWN & SHARPE
No. 12 PLAIN
MILLING MACHINE
3, 7½, or 10 HP
Spindle Drive



PROGRESS IN PRECISION FOR 125 YEARS

B·S Brown & Sharpe

MILLING, GRINDING, AND SCREW MACHINES • MACHINE TOOL ACCESSORIES • PRECISION TOOLS • HYDRAULIC PRODUCTS • CUTTERS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

The Day After Tomorrow

Metalworking will be going through a revolution in technology the next decade.

Much effort will be put on making a final product without machining it or with a minimum of machining. Such processes as cold forging, hot and cold extrusion, casting and forming should take big strides forward.

These processes are what . . .

one Ford official has labeled moving rather than removing metal. Roll flowing is one of the latest developments with interesting possibilities.

The speed and ease with which metal stampings can be made is one of today's technological developments that will carry great impact in considering how a product can best be made.

Methods of removing metal will be vastly improved. Cutting of metal is already being done successfully by such unorthodox newcomers as chemical milling, electro-erosion and ultrasonic machining.

The traditional types of metal-cutting machines will bear slight resemblance to those in the past. They will cut metal much faster to closer tolerances automatically. They will require ceramic as well as carbide tooling, more horsepower, more rugged construction, better controls, more automation.

More gaging will be done . . .

at the machine. Precision work will be so fine that acceptable limits of ten-millionths of an inch will not be uncommon.

Many of the drastic changes will be accelerated by the new and challenging demands of the aviation and missiles industries. These industries will be pioneering in the working of new exotic metals. Their efforts will be spurred by the necessities of national defense as well as by commercially competitive factors.

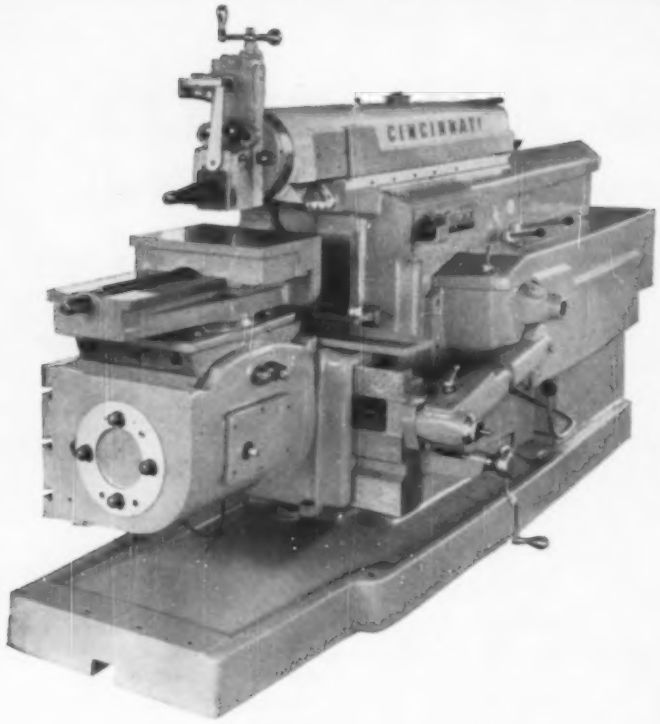
It is not the glamorous aviation and missiles industries alone that are searching avidly and expensively for new things in Metalworking. Caterpillar Tractor Co, for one, is trying to develop stronger, longer lasting materials, new and improved power plants, new means of transmitting power, new controls to multiply human strength and judgment. Allis-Chalmers announces that it is trying to break through barriers limiting present practices. It is convinced that whole new horizons will be visible if materials can be perfected that retain their properties at high temperatures.

We could go on and on . . .

citing what other metalworking companies are striving for. The point is that no alert, progressive manufacturer with any regard for where his business may be five to ten years from now is absorbed exclusively in solving today's pressing problems. That is unthinkable. He is devoting a lot of time, manpower and research to future materials, future production methods, future products.

Today is important. So is tomorrow. But of transcending importance is to be thinking and planning for day after tomorrow. If you fail to do that, the day after tomorrow will be here and you will be sadly unprepared for it.

Burnham Finney EDITOR



Cincinnati standard features: extra savings at no extra cost

Cincinnati Shapers give you so many money-saving features per dollar invested that they can be the most profitable equipment in your shop.

1. This 2" cut, .030" feed, demonstrates the ability of the 50 psi automatic lubrication system to maintain oil films under heavy leads.

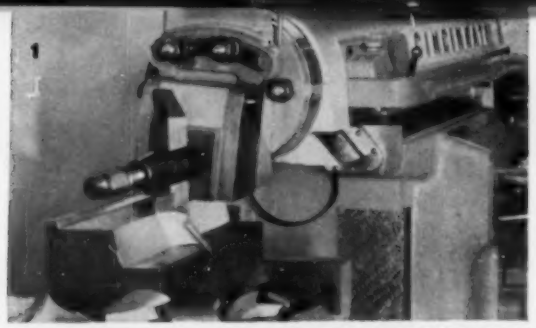
2. Brushless electromagnetic brake and clutch insure fast, easy operation. No adjustment is required.

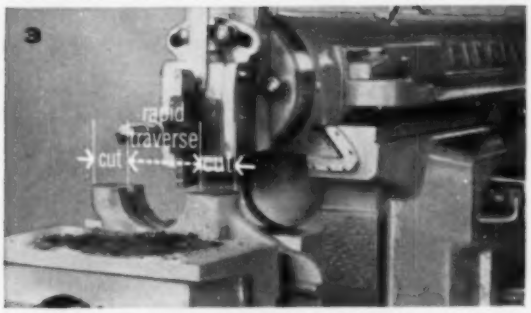
3. Both vertical and horizontal rapid traverse are standard Cincinnati features which substantially reduce setup and cutting time.

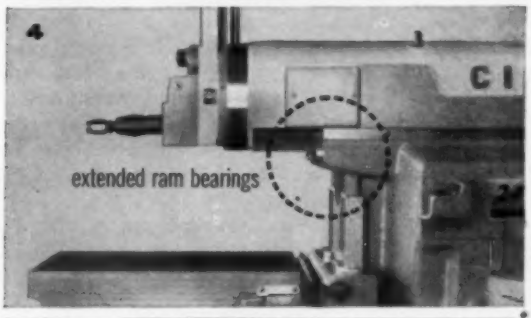
4. Extended ramway bearings increase ram support and minimize wear. Full table clearance to the column gets work closer to the column, minimizes overhang.

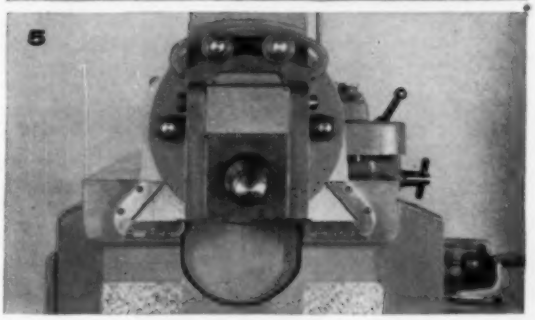
5. The vee ramways are integrally cast with the column. Ramway rigidity is increased by eliminating joints. Full length tapered gib provides for easy adjustment, maintains accuracy.

Write Dept. A for Bulletin "Cincinnati Rigid Shapers."









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THE CINCINNATI SHAPER CO.

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Has plant and equipment buying bottomed out, or no?

Capital spending stumps experts

WASHINGTON—The latest report on industry's plans to buy new plant and equipment have government experts baffled.

There's no doubt but what the figures in the chart below show that businessmen are continuing to cut their purchase of capital goods. This year's estimated spending now is put at 17% less than the record $37 billion of 1957. In March, when the last previous survey was taken, businessmen said they planned to reduce their buying of such goods by only 13% under the 1957 figure. The difference amounts to a decline in spending plans of about $1.3 billion between March and now.

The situation that is furrowing the economists' brow is this:

- The figures indicate that the worst slash was concentrated in the first quarter this year, and that the rate of reduction is leveling out. If this turns out to be the case, then it could be that there's good news ahead—in that the drag on business recovery accounted for by soggy sales of capital goods may soon be over.
- On the other hand, the extremely heavy slash in spending plans shown for the first quarter of this year may still be going on—which would mean that businessmen are still cutting their actual purchases more than they have predicted they would when asked to put a figure on their plans to buy.

If the expected outlays for 1958 as a whole are borne out, the decline will continue through the fourth quarter. Here is the way quarter expenditures would stack up for the year: first quarter, $8.1 billion; second quarter, $7.84 billion; third quarter, $7.58 billion; fourth quarter, $7.25 billion.

Government analysts are wary of drawing conclusions about the fourth quarter, however. It is always the most volatile of the year, as businessmen shift their expenditures up or down in accordance with the year-end outlook. If business shows the broad improvement most administration economists are predicting, then investment plans might be increased in the fourth quarter.

Most of the government analysts who specialize in plant and equipment estimates believe that intentions for the rest of 1958 will turn out to be fairly accurate. They think the first quarter acceleration of cuts is not being repeated on a significant scale now, and is not likely to be the rest of the year.

"That first quarter looms up as something special," one expert puts it. "It sticks out like a sore thumb on our charts, and we doubt whether any other quarter during the recession will come to close approaching it for magnitude of cuts."

This group cites the effect of adverse weather on the first quarter, for one thing. Two heavy storms hit the Northeastern part of the country, disrupting deliveries and halting work in progress. They believe part of the reduced spending (due to weather) is reflected in higher totals in the current quarter, but not all.

One group of government economists—the professional staff of the Joint Economic Committee of Congress—takes a gloomier view of plant and equipment trends. In a memorandum prepared for Rep Wright Patman (D-Tex), chairman of the Committee, the staff warns that the decline is progressing at an average rate of $2 billion per quarter (annual rate) and that by the fourth quarter of 1958 the decline will be $10 billion below the high reached in the third quarter of 1957. The staff informed Congress that in its opinion, the decline seems likely to continue into the first half of 1959.

The Commerce-SEC survey, which does not include any guess as to 1959, nevertheless points to the same conclusion. The spending rates implied for the fourth quarter indicate as large a decline as in the second and third quarters, if not a little larger. A continuance of the reductions into 1959 seems a certainty.

What US Business will spend this year
(millions of dollars)

	Estimated Total 1958 spending*	1958 by quarters Jan-March	Apr-June*	July-Sept*
ALL MANUFACTURING	**$12,039**	**$2898**	**$3235**	**$2987**
Durable goods industries	**8022**	**1441**	**1533**	**1409**
Primary iron & steel	1181	315	318	272
Electrical machinery	531	106	133	150
Machinery (exc. electrical)	1041	255	286	249
Motor vehicles, equipment	687	143	182	198
Transportation equipment (excluding motor vehicles)	401	93	106	103
Stone, clay, glass products	408	102	100	106
Other durable goods	999	276	265	236
Nondurable goods industries	**6329**	**1457**	**1702**	**1578**
Food, beverages	714	170	208	174
Textile mill products	252	73	71	55
Paper & allied products	570	141	162	142
Chemical & allied products	1388	340	372	346
Petroleum & coal products	2837	587	746	721
Rubber products	163	37	39	43
Other nondurable goods	405	109	104	97
Mining	936	225	254	231
Railroad	735	256	224	149
Transportation (non-rail)	1470	398	386	330
Public utilities	6294	1227	1768	1768
Communication, commercial and other	9296	2321	2395	2235
ALL BUSINESS	**30,770**	**7325**	**8262**	**7700**

*Estimates for 1958 are based upon actual expenditures for the January-March quarter, and upon anticipated expenditures for the remaining quarters of the year, as reported by business in late April and May 1958.

Free trade zone for Ohio?

BELLEFONTAINE, OHIO — A plan to establish a free trade zone near here—an international trade and manufacturing center where foreign products could be stockpiled and processed without payment of import duties and taxes—is gaining momentum. The project, a private development of the Stride Exchange System, calls for a 3000-acre site.

This is in accordance with the Foreign Trade Zones Act of 1934 as amended in 1950, and requires approval of the Foreign Trade Zones Board in Washington. Presentation will be made before year's end. The project, to be called "Inlandia," would be a fenced, policed area with facilities for receiving, sorting, grading, packaging or assembling imported goods (mostly machine tools and other industrial equipment) either for sale in the U S or for export to other nations. U S Custom fees would be paid only on items shipped from the Zone to markets in this country.

This, according to Stride's head, C C Wood, would "make it possible for foreign suppliers to American industry to stockpile their products in the Zone without payment of duty. In turn, this would enable American manufacturers, especially smaller concerns, to buy to far greater advantage."

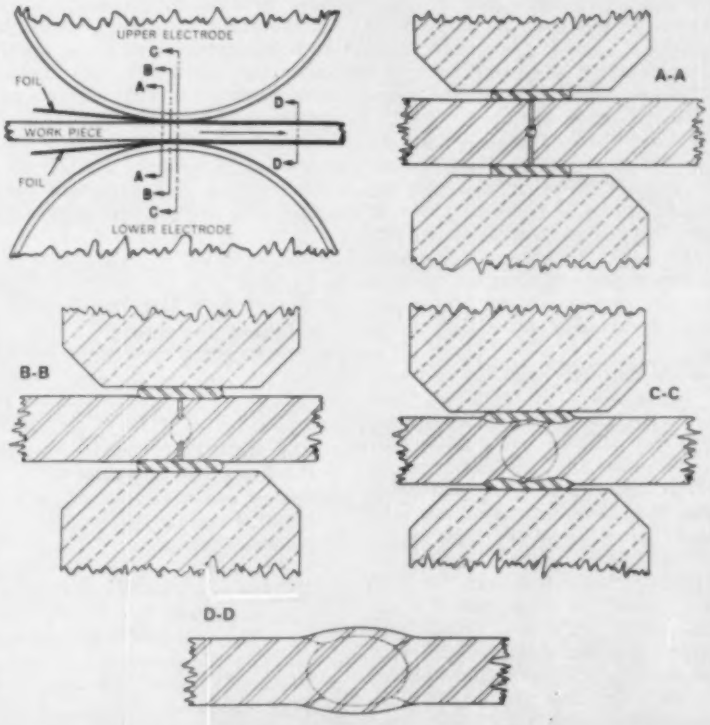
In other words, if a foreign machine tool maker ships machinery to this country in a knocked-down condition he will pay duty only on the value of the components. And he could establish an American branch or a subsidiary at the Zone to assemble the machine. Too, under Ohio law, Zone facilities may also be used for "the full exhibition of foreign merchandise without bond, for an unlimited length of time and with no requirement of exportation duty or payment." The owner may also sell from stock.

Inlandia has produced mixed reactions from Ohio machine tool makers, who could be expected to be affected most by it. Said one, "This would certainly keep us on our toes, however, I feel that the metalworking machinery made in this country is better adapted to U S use than foreign machines and can be sold in foreign competition despite the difference in labor rates. Quality of performance and service will tell in the long run."

Another manufacturer said, "This would be all right if we had equal access to markets abroad—but we don't. Our efforts to trade in foreign countries are too often blocked by currency controls and restrictions."

Still another had this to say, "From our standpoint, there is not much to be gained from Inlandia. We are having a tough enough time as it is without encouraging the free display of foreign products in our own back yard."

European foil butt seam welding process comes to the U S



Machines employing the Peco Foil Butt Seam Welding Process, a European development, are now being made in the U S by Precision Welder & Flexopress Corp, Cincinnati. Machines make smooth, non-overlapping, dense seam welds, achieving high strength, at higher speeds than ever before reached, according to Precision. Welds have been made on 0.079-in. stock at 3 to 24 sfpm on mild steel, low alloy, high carbon and stainless. Thin strip of foil is introduced on each side of butt seam. This acts as a bridge to distribute welding current to both sheets, prevents too-rapid withdrawal of heat from the joint area. Foil strip offers added electrical resistance, helps contain molten weld nugget while it grows in area and cools. Sheets are generally clamped, and foil can be spot tack-welded at lower heat before being seam welded.

How to AUTOMATE production equipment...

4. Magazine and chute feeds

Case studies show how recently developed feeders have been applied to improve production flow. Here is more on loaders and unloaders, following our Special Report (*AM*—Apr 21 '58, p145), which covered vibratory, centrifugal, and hopper feeders . . .

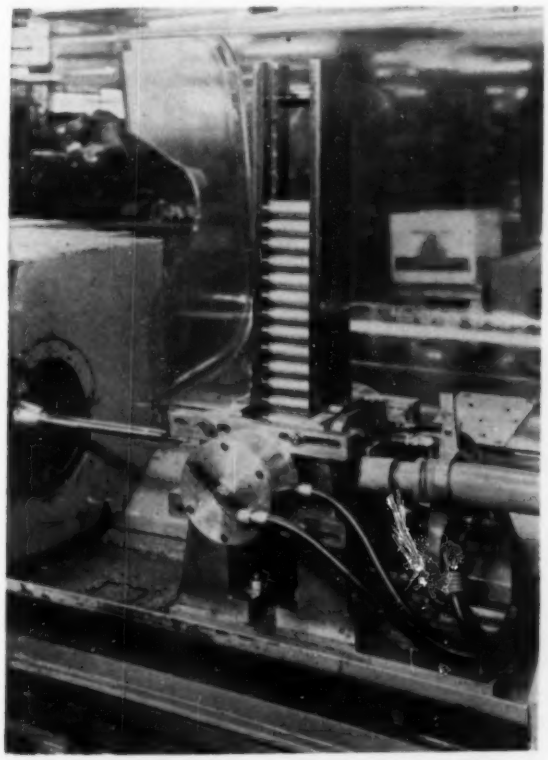
RUPERT LE GRAND, senior associate editor

For many years, magazines and chutes have been used on machine tools of many kinds to speed loading, reduce fatigue and obtain safer working conditions. The advent of automation ten years ago has merely stimulated much more attention to the virtues of magazines and chutes.

These devices are often relatively simple. They can be designed into the machine tool or added later. Most machinery builders are fully familiar with them and consider them part of the tooling when required. Often a shop builds its own devices of this kind or has them made by a special-machine builder or tool shop.

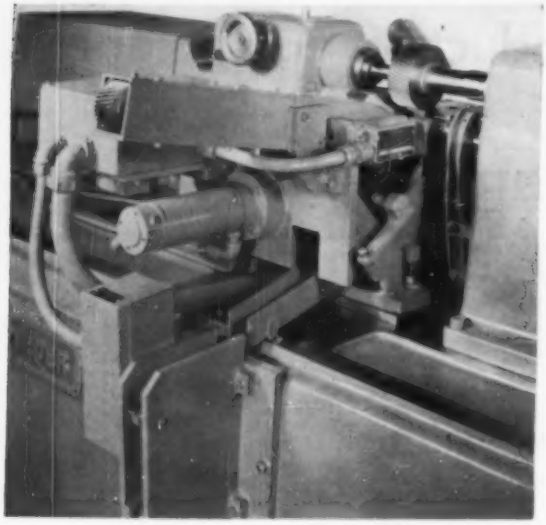
In many cases, the magazine is the most logical connecting point between other automation and the machine itself. A storage hopper, vibratory feeder, some other kind of feeder, or even a conveyor, can be arranged to deliver workpieces from a preceding operation without rehandling. These additional automation features are often added at comparatively small expense. When they are installed, one drawback to magazines and chutes is removed—their limited storage capacity and the need for an attendant.

Even so, magazines and chutes do speed up operating cycles and they permit operators to handle more than one machine. Whether you can go eventually to a fully automated sequence of operations then depends upon your volume and shop conditions.



Gun drilling aided by magazine loader

Bronze bushings 3⅝ in. long are automatically positioned for gun drilling from a feed magazine in this application on a single-spindle boring machine. An undrilled part falls into drilling position after the finish-drilled part is ejected automatically from the machine by a hydraulic cylinder-operated mechanism. A Starbore two-flute carbide gun drill produces a ¾-in. hole from the solid to a 0.0005-in. tolerance and a 0.005-in. concentricity specification. Drill feed is 35 ipm and a 10-15 mu-in. rms surface finish is produced in the hole. Operation is being carried out in production gun drilling department at Star Cutter Co, 34500 Grand River Ave, Farmington, Mich. Automatic loaders are extremely economical devices on such high-speed drilling operations.

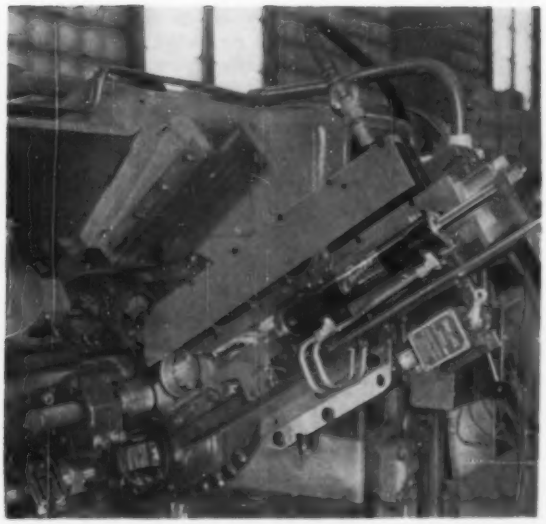


Gear speeder fitted with magazine

A recent development in the gear inspection field is fully automatic sound testing, using electronic listening devices in conjunction with automatic gear speeding equipment. To speed the operation a magazine feed and automatic loader device has been applied to a Red Ring automatic electronic gear speeder designed and built by National Broach & Machine Co, 5600 St Jean Ave, Detroit 13.

Gears are fed from the magazine, one at a time, into mesh with the master gear by the action of an air-cylinder-powered, rocker-type loader. The gear to be sound tested is run in both directions under loading conditions during the sound-test cycle, while a microphone near the meshing area analyzes the sound level. The tested gear is unloaded automatically.

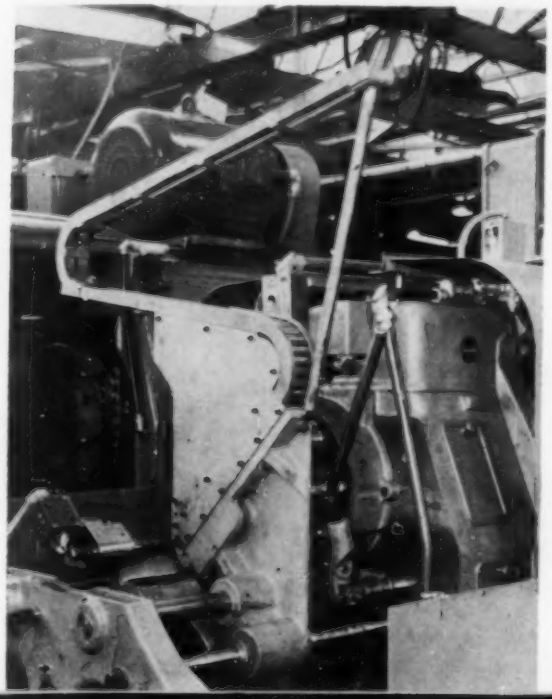
Magazines find greater use on bar machines and chuckers

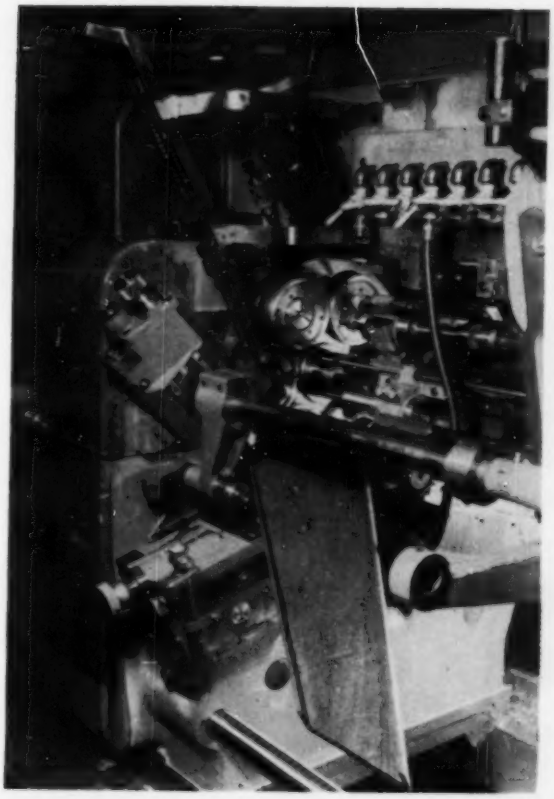


Gravity-type magazine . . . using air-operated transfer slide, positions the work for mechanical loading into the chuck. This type of magazine and loader can be applied to bar machines for secondary operations on machined or pre-formed parts. It also can be used on chucking machines for forgings or castings

Loaded through spindle . . . a gravity-type magazine is used for automatically loading such parts as piston pins, valve guides, etc into a National Acme bar machine for drilling and other machining operations. In this application, the part is loaded through the spindle from the rear of the machine. The S-type chute is used to accommodate the maximum number of parts when manually loading. However, this type of magazine can be used satisfactorily with a standard type hopper

For a number of years builders of bar machines and chucking machines have supplied magazines with their equipment, so that one operator could serve several machines. Here are examples of equipment supplied by the National Acme Co, Cleveland. This company does not design or build hoppers or conveyor systems, now much used to keep magazines filled, but does furnish magazines of various types as part of the tooling. By the addition of storage hoppers, vibratory feeds, or connections to conveyors, a long step forward is taken in automating the setup.



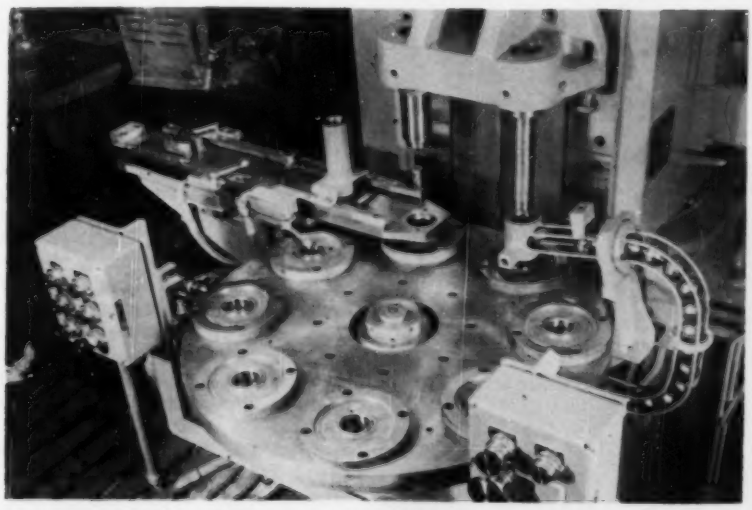


Bar machine served by magazine-loading device

Most Warner & Swasey machines are sold to customers who produce small lots rather than large ones. However, a magazine-type loader was recently furnished on a 1¼-in. 6-spindle bar automatic as a special item. Machine functions: collet-chuck opens, finished part is ejected, magazine moves into loading position, loading arm on main toolslide inserts next piece into collet, collet closes, loading arm retracts, magazine retracts to back position, machine indexes.

Magazine is placed . . . at 6th position of Warner & Swasey 1¼-in. 6-spindle bar machine. Machining is performed at all other stations

Three automation devices combined on vertical assembly machine

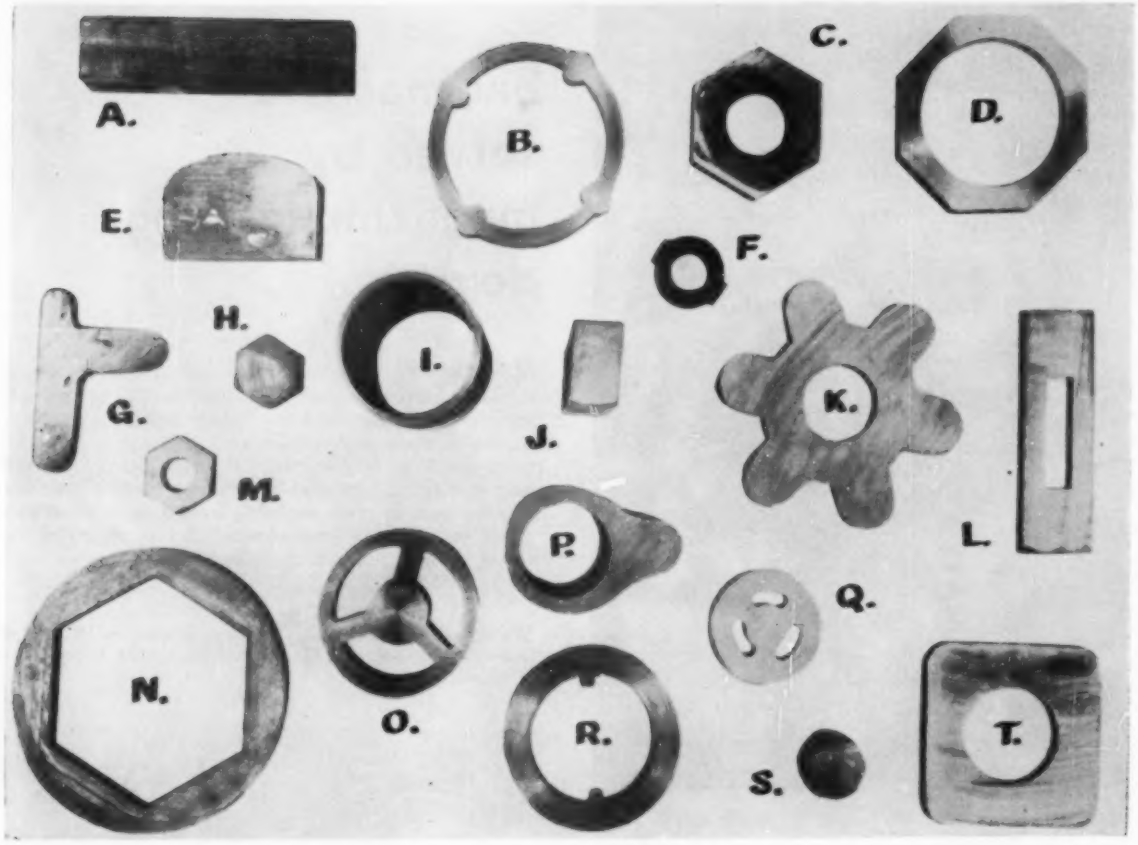


Magazine feed on slide . . . supplies bushings to left-hand pushing station of American vertical assembly machine. On a 6-sec cycle, production is 400 assemblies per hr at 100% efficiency

A dial, a magazine feed, and a ball-recirculating system are combined in an American T-6-24 vertical machine, built for assembling a bushing into a cover and burnishing the bushing ID. As furnished by the American Broach & Machine Co, Ann Arbor, Mich., the machine has a two-station push head.

In operation, cover parts are loaded into the indexing dial table. Bushings are fed in over the cover at the left-hand pushing station and pressed in. After indexing to the right-hand pushing station, a burnishing ball is pushed through the previously assembled bushing. With the table completely loaded, one assembly is secured per cycle.

part 4 on magazine and chute feeds will be continued in an early number



Wide variety of shapes...
... can be made by the Asarcon continuous-casting process: (a) sliding way for an ATF printing press, (b) shape designed for Naval Ordnance use, (c) nut stock, (d) octagon nut, (e) sliding way for a dam gate, (f) special nut stock, (g) pistol shape used in thread guide of a textile machine, (h) nut stock, (i) bushing, (j) bronze key stock, (k) six-tooth gear blank for gear-type pump, (l) slide-valve bushing for air brake, (m) nut stock, (n) shaft bushing, (o) valve seat, (p) connecting rod, (q) valve seat, (r) seat rings, (s) rod, and (t) a special bearing designed for hospital beds

'Slice 'em yourself' castings

BARBER, N J—Continuously cast copper alloy rods, tubes and shapes up to 12 ft long (16 ft in some instances) that can be cut apart into individual castings are cutting costs and machining time at American Smelting & Refining Co's plant here. Practically all standard tin-bronze alloys, including lead, zinc and nickel-bearing varieties, can be cast to size.

The wide variety of shapes and forms available in continuously cast bronze make it possible to adapt bar lengths to applications where castings and machining costs have previously been prohibitive. Shop costs are reduced by substituting cast rods, tubes, and shapes for individual castings. The bars are also suited for machining on automatic screw machines, and in short lengths for chucking machines.

Shapes can be bought in long lengths and cut to desired thicknesses, or in exact lengths for individual parts.

Relatively simple shapes have been produced with minimum section thickness of ¼ in., inside cores of 7/16 in., and OD of 9⅛ in. However, fairly complex shapes can also be produced if design sketches and bronze composition are submitted for consultation.

Savings in machining and inspection time result from faster cutting speeds, less metal removal, longer tool life, and fewer rejects because of metal flaws. The graphite dies that produce the continuous cast bars are relatively inexpensive and are expendable after an average life of 24 hr. These dies also allow for economical small quantity runs of special sizes and shapes that can be used in an as-received condition. Surface condition of continuous cast bars is equivalent to a mill product finish.

Continuously cast bars raise the fatigue characteristics of an alloy from 33% to 100%, and impact strength from 15% to 50% of an identical alloy cast by any other method. Typical tensile and yield strength—as well as elongation, reduction, and Brinell hardness—are better than the same physical properties obtained from either permanent or sand castings.

Microstructure of these bronze bars is superior to bronze alloys cast

from permanent or sand molds. They have no porosity, blow holes, pits, or shrinks. There are no sand inclusions, or other foreign matter to harm cutting tools. Also, the fine uniform dispersion of lead and other elements excludes all hard and soft spots.

Bar diameters are available from 13/32 to 9⅛ in. OD. Dimensional tolerances on bars and tubes up to 5 in. are +0.004 to −0.006 in.; over 5 in dia ±1/64 in. Concentricity of tube diameters is within 1½% of wall thickness. Bar and tube straightness is within ⅛ in. max arc height in a 5-ft span. In general, clean-up allowance for machining is 1/16 in. for OD, and 1/32 in. for ID.

Asarcon 1010B replaced a worm gear material SAE65 with a 35% improvement in gear life, because of quieter operation and lower friction loss. These worm gears drive twin contra-rotating polishing or scrubbing brushes and must bear the brunt of hard service, yet be machinable. The Asarcon alloy hollow bar is purchased in 12 ft lengths and machined in a six-spindle National Acme automatic. Machining requires removal of 1/64 in. from the OD and ID and gear blank is cut off in ⅜ in. lengths.

Oil pump connecting rod (Asarcon 77) cast in a "keyhole" shape replaced a sand casting of SAE 660 and resulted in improved pump performance, and a considerable saving in material. Connecting rod ¾-in. wide is sliced from a 12 ft bar, and in operation acts in effect as a combination connecting rod and bearing.

Acme Die Design School Expands

SOUTH BEND, IND—Acme School of Die Design Engineering has moved into its own $93,000 air-conditioned building at 504 Calvert St here. In contrast to 1935, when the school was founded by Stanley R Cope with 10 students, current enrollment in the South Bend, Elkhart, and LaPorte schools numbers 285 mature students, who may elect either die-design engineering or tool designing.

Mr Cope founded the school because of the difficulty generally experienced at that time in finding capable die designers. Demand for training was so great that he resigned his position as chief die engineer for Bendix Products to prepare the widely known Acme copyrighted lesson texts. The courses now consist of four volumes on die design and four volumes on tool design. Material on deep drawing was published in 26 installments in *American Machinist*.

Influence of the Acme system has spread throughout the country and to Europe. Eighteen schools, in addition to the three mentioned, now use Mr Cope's lesson material. Current enrollment in Acme and associated schools numbers 1370 full and part-time resident students in these courses, plus 414 others who are taking Acme training by correspondence or in company-sponsored programs. Altogether there are about 6000 graduates. Of these, 2722 have been graduated from the South Bend and Elkhart schools. The breakdown by options is: 1209 in die designing, 909 in tool design, and 604 who have been awarded diplomas in both courses. Twenty-nine of these men came from foreign countries.

Acceptable students enter the Acme school at any time there is a place for them. Full-time students take four terms of work of 300 hours each, and attend the school Monday through Friday for 48 weeks. Objective of the training is to produce a die designer who knows the practices accepted by better-class shops and who can produce finished designs at a speed sufficient to justify high starting pay. Many graduates have become chief engineers or owners of their own shops.

Machine Capability . . .

NEIL B MacLAREN,
director of quality control
BROWN & SHARPE MFG CO,
PROVIDENCE, R I

A key to lower costs

Don't leave related costs out of your machine-replacement studies. Even if you can't increase production with a new machine, you may earn handsome dividends by reduction of inspection and defectives. Here's a case example

Not every case of potential machine replacement is an open-and-shut proposition. You have to look beyond the immediate problem, or else you may go wrong and pay for your mistake for a long time.

Here is the way a mistake can be made. As you know, machine-tool builders are often asked: "How much will machines of new design increase production?" On some parts there may be an excellent opportunity to increase production, because of higher spindle speeds available on new-model equipment. But, sometimes, no appreciable increase in production can be realized. Shop management may then decide to get along with the old equipment. That is the mistake—failure to look into the matter further.

CAPABILITY MEANS ACCURACY

Here is the point where a machine-tool builder familiar with the practical application of machine capability can be of great service. For machine capability is a common way of expressing a machine's ability to hold accuracy. This is a feature often overlooked by customers. They often fail to realize how ability to hold accuracy cuts related costs—inspection and defectives.

Suppose the shop says:

(*a*) "The tolerances on our parts are usually 0.0015 in."

(*b*) "We do not require machines with a capability of 0.0004 in. (as in a new machine)."

In a recent field test, our representatives were requested to make machine-capability studies of screw machines in actual production. The studies of installed equipment indicated machine capabilities *approximating the tolerances* on the blueprint. But many inspectors were employed, indicating the presence of 100% inspection. The foreman reported 15% defectives. In one particular case, the inspection time was greater than the production time rate of 1200 pc per hr. For a 40-hr week, this meant an inspection cost of 2000 hr per yr with a minimum additional cost of 300 hr per yr for replacing defectives.

A screw-machine shop that employs 100% inspection should take another look. Such a high degree of inspection is costly and should not exist in any shop, except in *rare* circumstances. A process inspection, possibly followed by sound sampling procedures, is equally as effective at greatly reduced cost. On the other hand, machines with poor capabilities may force manufacturers to employ costly 100% inspection.

Let us discuss machine capability —what it means and a specific case example.

A machine capability study is an expedient method of determining the tolerances that a machine is capable of holding. The results reflect the design of the machine, its rigidity, its alignments etc. In such studies, no adjustment of tooling should be permitted. The following procedure is used at Brown & Sharpe:

(1) Stabilize machine

(2) Observe production to determine what normal variation exists

(3) Plot measurements of consecutive pieces

(4) Take groups of 5 and determine the range

(5) Compute the average of the ranges

(6) Multiply the average range by factor 2.58

The above procedure can be performed by any competent screw-machine operating personnel.

1947 MACHINE

Now for the field study mentioned. The part is made of hard brass. On a 1947-model No. 00 machine, the spindle was normally operated at 6050 rpm and the feed was set at 0.0012 ipr. A circular HSS form tool was used.

The blueprint tolerance of the important dimension on this fitting is 0.0015 in. The machine capability, as determined by Fig. 1, is 0.0011. This leaves a working span of only 0.0004 in.—not much leeway for an operator who is handling three other machines, one of which had a higher machine capability than 0.0011 in. All parts from this particular machine had to be 100% inspected, and defectives were approximately 15%.

A similar job was set up on a new design (1956 model) No. 00 machine under the same operating conditions. This new machine's capability is shown on Fig. 2 as 0.00044 in., which gives the operator a working span of approximately 0.0011 in. compared to 0.0004 in. on the field machine.

CONTROL LIMITS

The new machine was operated for over 8 hr. The control limits for the averages were set from the machine capability; viz., a distance of 0.0002 in. from the upper blueprint limits. The setting of these control limits deviates from the usual practice in that full allowance is given for tool wear. The control limits for the ranges was set as four-fifths of the machine capability, or approximately 0.0003 in. The process results are shown on Fig. 3.

This study indicates that the operator can run the new machine all day with only three adjustments. A sampling inspection of the day's run revealed all parts to be within tolerance. No 100% inspection and practically no rejects!

Similar savings on inspection costs and defective work can be duplicated in many plants, on many kinds of machines. In the case of replacement made "doubtful" because an older machine will run about as fast as a new model, don't drop the matter by saying: "The new machine costs more," or "We can fix up the old one for less money than buying a new machine." You may well stay behind the 8 ball without knowing it.

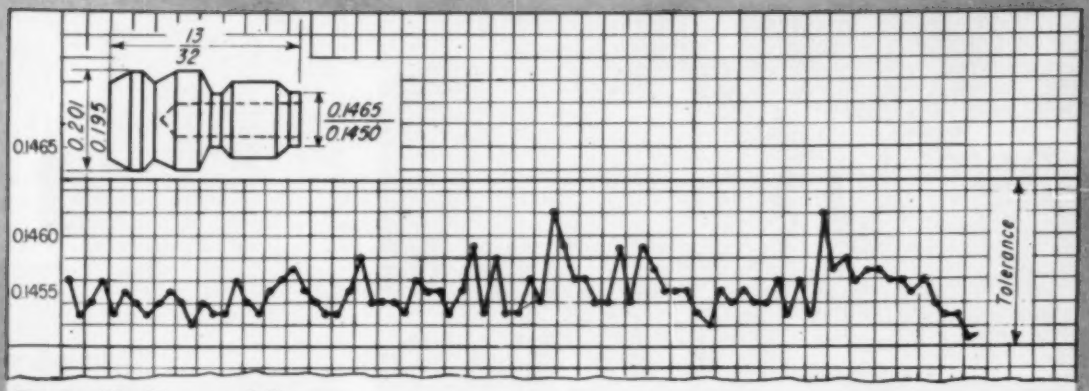


Fig. 1—Machine capability . . .
of 1947-model No. 00 screw machine on hard-brass part was 0.0011 in., but blueprint tolerance is only 0.0015 on 0.1465-0.1450 in. dimension, giving a working span of only 0.0004 in. Result: 2300 extra man hours per year for 100% inspection and replacing defectives, or well along toward the price of a new machine

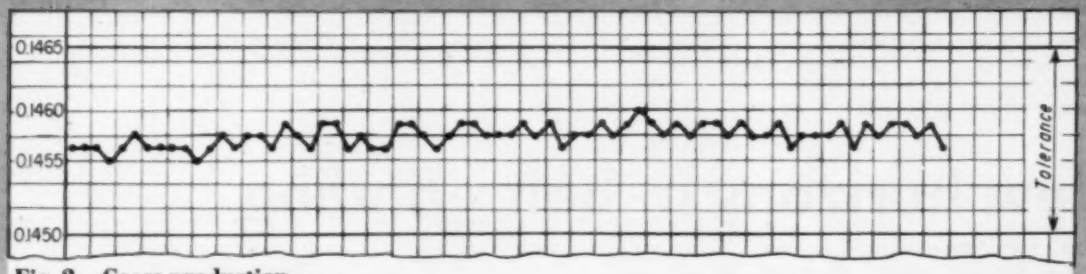


Fig. 2—Gross production . . .
on the same part is still 1200 pc per hr on a 1956-design No. 00 screw machine, but this machine has a machine capability of 0.00044 in. Was this ability to hold close tolerances unnecessary on the product?

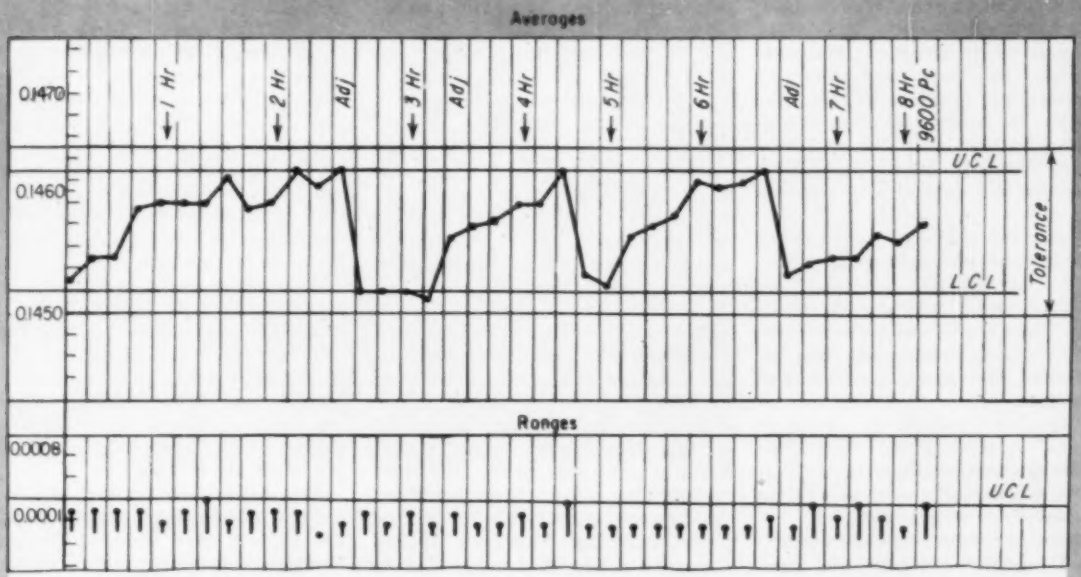
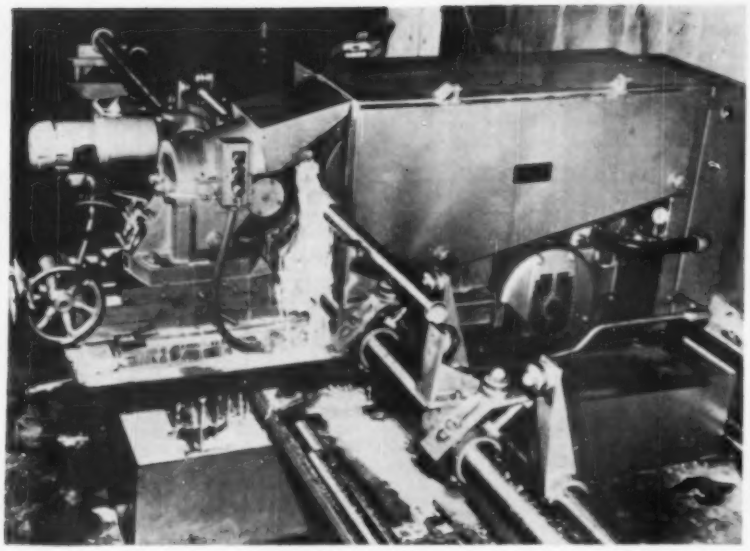


Fig. 3—With a working span . . .
of 0.0011, full allowance is given for tool wear, the operator needs to make only three tool adjustments in an 8-hr shift. No longer is 100% inspection required. Rejects are virtually eliminated because of the control limits available



Heavy-duty centerless driver . . .
. . . displayed at the Behr-Manning show is built by Engelberg Huller, is designed for precision work at high speed on rod or tube stock up to 8 in. OD. Through feed rates range from 4 in. per min. to 40 ft. per min.

Two-head flat finisher . . .
built by Hammond Machinery uses an abrasive belt as conveyor, can be operated wet or dry

New horizons in belt grinding

TROY, NY—There were some eye openers for the several thousand visitors to the Third National Coated Abrasive Machinery Show. Staged by Behr-Manning Co, a division of Norton Co, during the week of June 9, the Show proved that:

• Abrasive-belt grinders are now machine tools. They equal or exceed bonded-wheel grinders in metal-removal rates in certain applications. Their accuracy is in the order of tenths. They can be equipped with automatic size control and automation.

• These new machines are opening up important cost-savings possibilities in the fabrication of articles from flat stock, tubing and extrusions. They are likewise doing dramatic things in finishing of partially fabricated stampings, forgings and castings.

Fifty-five machinery builders showed equipment for work on metals, plastics, wood, at the exhibit in Behr-Manning's new $1 million Product Engineering Bldg.

Major new ideas appear to be:

1. To finish non-pickled HR steel, either at the consuming plant, a jobbing finisher, or in a warehouse, to save most of the extras charged for producing and shipping cold-rolled steel.

2. To buy tubing in the as-drawn condition, and remove scale, scratches and "bad spots" just before use; likewise to save mill premiums, or extras.

3. To machine precision cylindrical parts to desired diameter and accuracy from tubing without turning and bonded-wheel grinding processes.

4. To do contour finishing with cam-controlling fixtures.

Here is some capsulized information on what some of the new machines exhibited can do:

• Flat stock up to 6 in. thick is ground to 0.0005 in. of flatness (on 4½ x 18 in. pc) on the No. 96 Series machines (Engelberg Huller), which are built with any number of heads and for stock widths of 6, 9 or 12 in. Machine removes 0.030 to 0.060 in. per pass, per head, and machine can be built with any number of heads.

• A cylindrical grinder for fan-motor rotors removes 1/32 in. stock, holds concentricity of OD and shaft to 0.0005 in., and produces 300 pc/hr. Automatic size control is by Federal Gage. Built by Engelberg Huller, the grinder can be hand loaded or automated.

• A swing-frame grinder that will grind into small radii, as at root of jet-engine blades, was shown by Stephen Bader & Co. Another example: feed worms for conveying equipment. Soft contact wheel and aligning device for belt allows working on side of belt to polish shoulders and fillets.

• Abrasive belt attachment (Production Machine) replaces the wheelhead on a Norton cylindrical grinder in less than a day's work. Savings in abrasive cost are estimated at 10 to 25%. Grinding results are said to be just as accurate as from a bonded wheel.

• Silver hollow ware, water-cooler tops and similar work can be contour polished on the Divine Model DLS machine fitted with a Job-O-Matic Jr work table.

Another centerless grinder, the Model 8132 by Engelberg Huller, is a large powerful machine tool that will remove 3 lb of steel per min. Outboard support can be unpowered for light work, powered when finishing 8-in. seamless tubing for hydraulic-elevator plungers. Automatic sizing holds dia to 0.0005 in.

Four-head flat finisher polishes aluminum extrusions and flat stock, one surface at a time, at 60 fpm. Hammond Machinery Bldrs say they will have another machine to finish both sides soon. Such equipment allows purchase of cheaper material from mill, and user removes scale, scratches and burrs cheaper than he can buy higher-quality material.

Materials Handling Show stresses cost-cutting

CLEVELAND—Recent trend toward heavy emphasis on cost-cutting (it was much in evidence at the recent Tool Show) again showed up at the four-day National Materials Handling Exposition here June 9-12. Some 6000 pieces were displayed by about 175 exhibiting companies. Nevertheless, this year's Show was considerably smaller than it has been in recent years, and really new materials handling concepts were fewer than they have been, too. The Show attracted about 15,000 people in its four-day run.

Observers noted that before the current business recession emphasis in the plant equipment field was on expansion to meet the growing production requirements of the economy. However, with manufacturers now indicating an increasing cost consciousness, nearly all exhibitors stressed the cost saving capacities of their products.

A number of displays reflected growing attention on the part of manufacturers toward cutting the costs of carrying and handling inventories. There were demonstrations of rack and shelving arrangements that can be erected to specific dimensions and dismantled, moved or altered at will.

One exhibitor, Hollaender Mfg Co, said its slip-on type fittings for the construction of pipe-type storage racks would save as much as 80% in labor and 30% in overall costs. The fittings eliminate threading and welding and reduce pipe cutting.

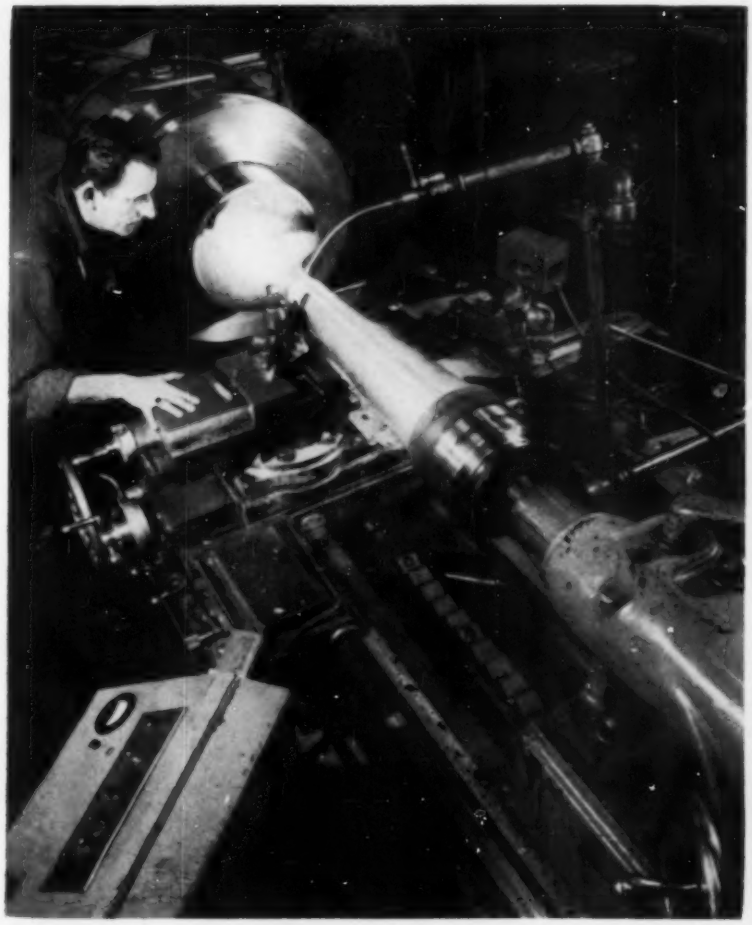
Packaging Cost-Cutters

Methods of chopping down the high costs of packaging and distribution also were exhibited. Allan Harvey, partner of Dasol Corp, New York, said in a conference session that "lopsided engineering" had caused "many of the gains we have achieved in production to be lost in materials handling, paperwork and other non-producing functions. Studies indicate the cost of getting goods from factory to consumer ranges from 25% to 52% of the selling price."

One way of cutting packaging and shipping costs was demonstrated by Acme Steel Co's "dexion-slotted angle" method, in which cold-rolled steel angles are bolted around aircraft and machine parts to form lightweight frames for shipment. An early user of this method, Convair Division of General Dynamics Corp, reports the new crating method saved the company nearly $150,000 in the first year it was used.

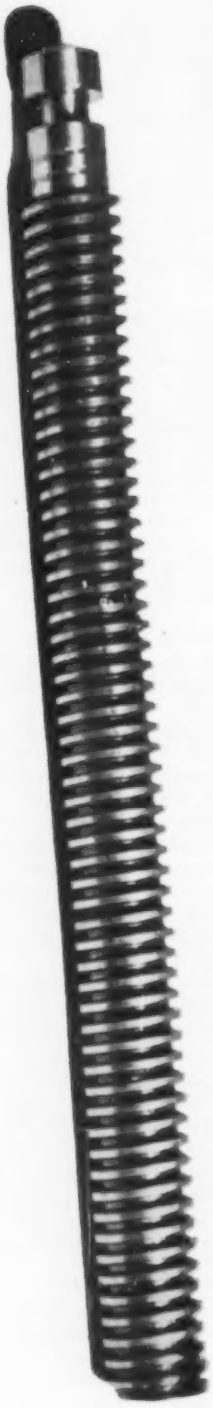
Plant Space Savers

Conservation of plant space was also a prime consideration of exhibitors. A compact, one-piece conveyor belt drive, with the motor and moving parts enclosed in the driving drum itself, was shown by Eberhard Bauer GMBH of West Germany. The enclosed drive eliminates V-belt arrangements, sprockets, motor stands and other space-occupying equipment, again cutting costs.

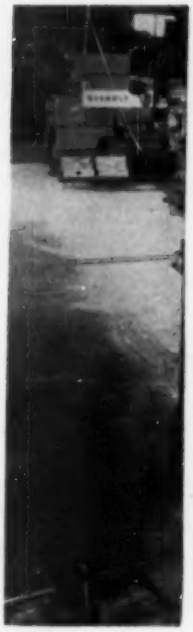


A Tiny Scratch Could Melt It

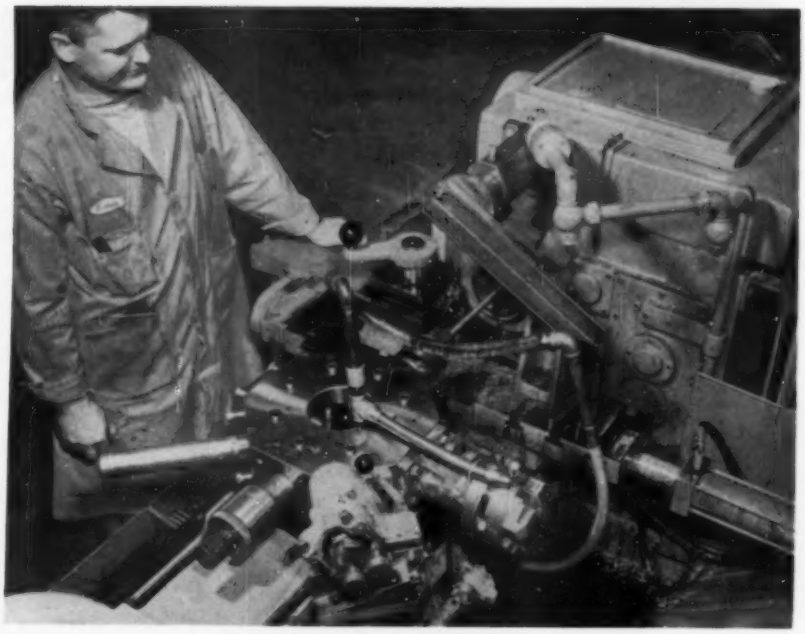
That's how critical surface finish is on this intricate nozzle for a hypersonic wind tunnel, shown being precision contour-machined at R H Freitag Mfg Co, Akron, Ohio. Designed to handle an air flow in excess of 5000 mph, the piece is contour-bored and turned to a constant wall thickness of 0.560 in. from a heat-treated stainless steel bar. Carbide tooling is used on this job on a 36 x 192-in. Monarch lathe equipped with Monarch-Keller tracer controls. If a surface blemish were to occur during machining, the nozzle would heat to incandescence and finally melt because of air friction produced by hypersonic flow



Six turret lathes take on job lots

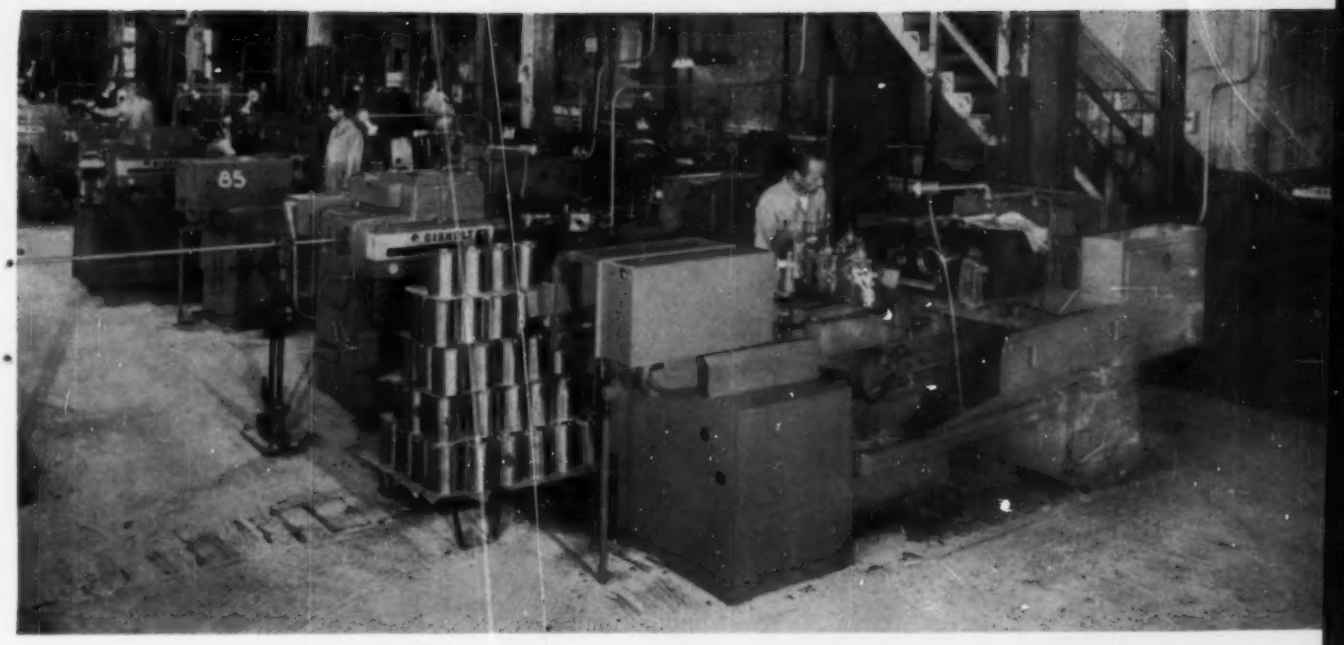


New machines were added to an assortment of old drilling and milling equipment, plus some old ram-type turret lathes, to transform a jobbing shop into an up-to-date competitive bidder. The lathes have hydraulic power for ram turrets and crossslides, and will work through automatic cycles to reduce human error, improve uniformity in the products, and allow fast retooling. Machines are accurate, and can be maintained easily. Because they can be cycled automatically, the turret lathes allow accurate price quotations, which helps trim costs for bids. The six machines were installed under Gisholt's leasing plan, which saved operating capital for current expenses. Following are three typical jobs that show how the machines work and what kind of work they do at Machine Specialties, Chicago.

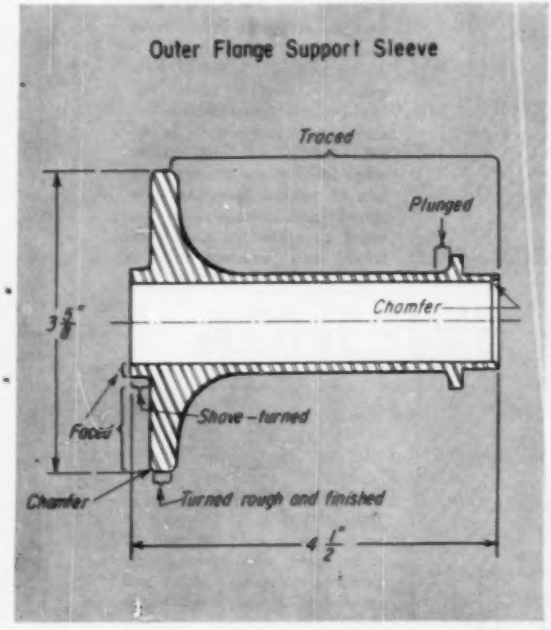


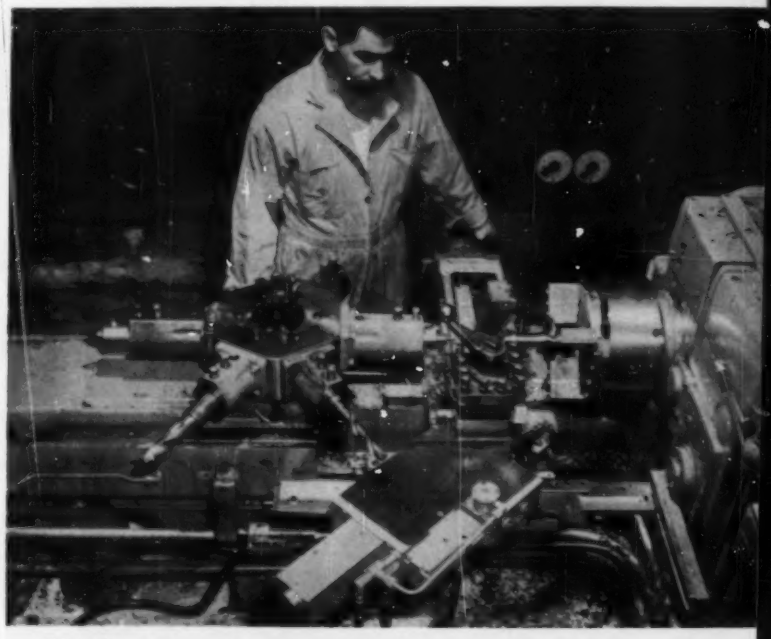
Adjusting screws with 5/8-in. Acme threads . . .
are produced with hydraulically powered octagonal turret and cross-slide, and airdraulic bar feed on No. 5 Gisholt. Lot sizes run 500-2500 pc; cycle time is 1.6 min; stock is leaded steel. These are the operations:

- Feed bar to turret stop
- Chamfer end with box tool to make accurate thread start
- Machine Class II thread on OD, using diehead
- Shift spindle speed and recock diehead with angle-iron cam mounted in place of overhead pilot bar
- Form-turn end closest to collet; work supported from turret by live center
- Catch work after cutoff in tube at last turret station



Battery of six leased turret lathes . . .
machines parts in job lots of 100-1000 pc. Operators can often handle two machines at once because turret rams, cross-slides, and stock feeds cycle automatically. Hand work is required only for checking parts and to load and unload

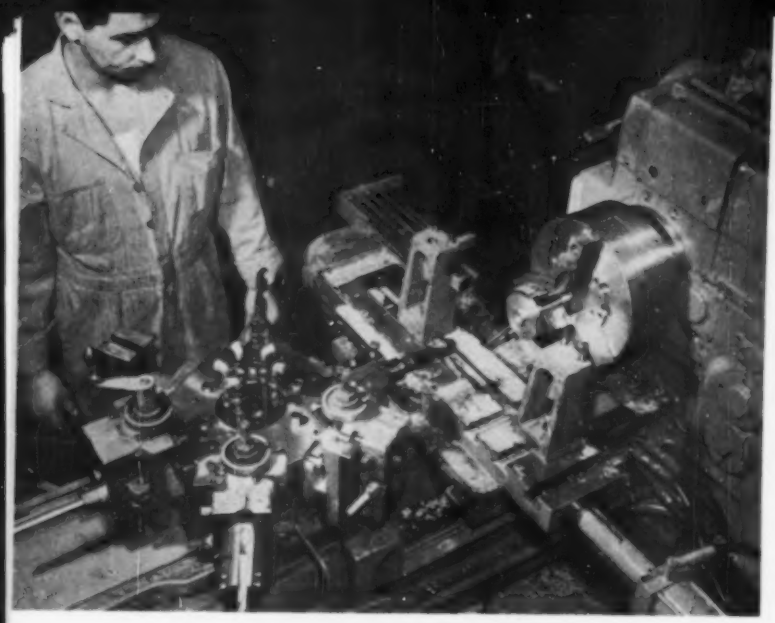




Outer flange support is machined . . .
with hex turret and JETracer on the rear of the cross-slide. Parts are mild-steel castings, and run in lots of 100 pc. Two machines complete them; the first has these operations:

- Chuck on rough flange with air fixture; two pie segments have two jaws each
- Centerdrill, then shift speed at next idle station
- Trace curved contour with part held by live turret center, making three tool passes; also face end
- Plunge-form radius behind shoulder with cross-slide tool
- Centerdrill and chamfer the bore
- Drill half way through the bore with recipromatic (chip-removing) action. Time for this sequence is 7 min

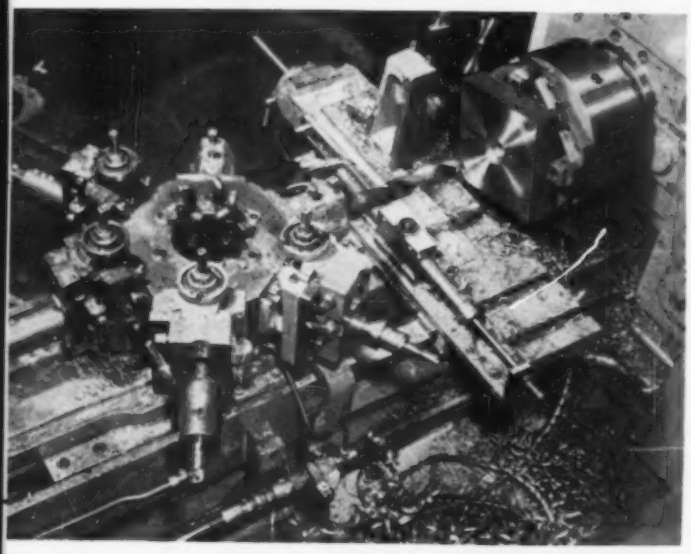
Job-Lot Turret Lathes . . .

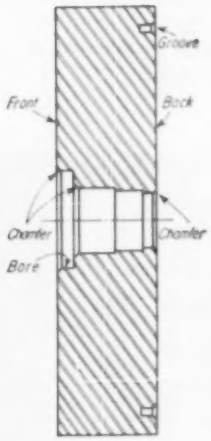


Second operation on flange support . . . is at another hex-turret lathe, with work chucked on the long OD by an air fixture having three soft jaws and locating pins. Sequence goes like this:

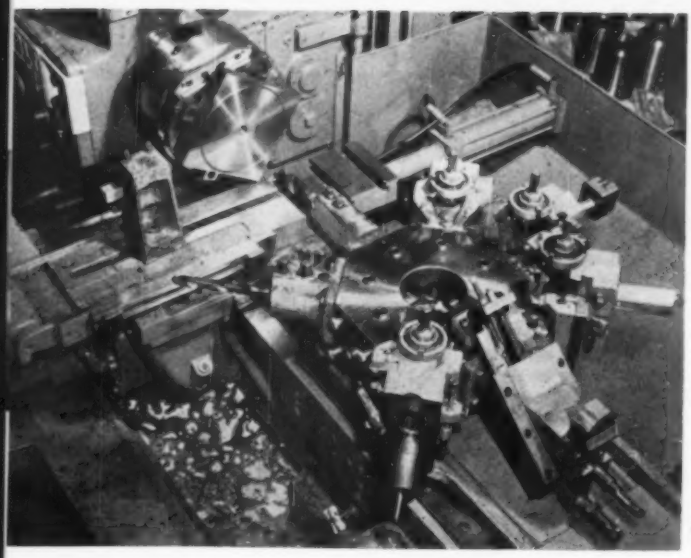
- Chamfer large-diameter shoulder
- Complete center hole, and face large end and shave-turn small shoulder from front of slide while tool at slide rear faces end of part
- Chamfer
- Finish-bore central hole
- Rough and finish turn largest OD

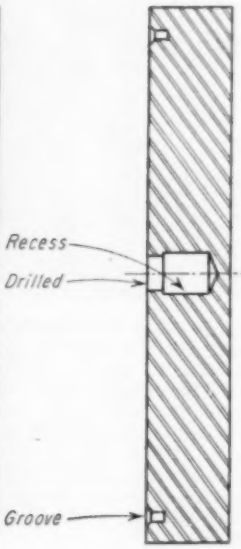
This takes 7 min. Final operations are back on JETracer lathe, where finishing cuts on contour take 2½ min.





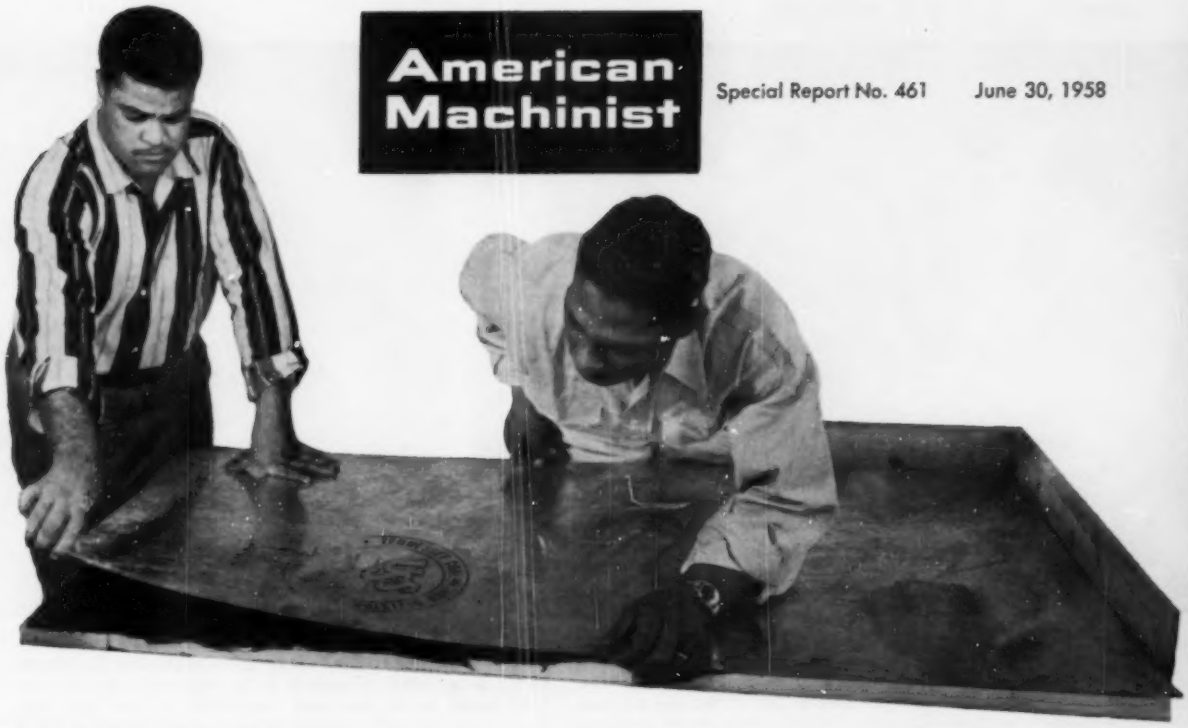
Heads for 8-in. air cylinders . . . are machined on two other turret lathes equipped with Lynn hex-turret and cross-slide drives. Two-jaw air chuck with split four-jaw faceplate fixture holds work for first operation. Part is drilled through, faced in front with cam feed on slide, and bored and chamfered with several turret tools—time is 4.5 min. Second operation on the other lathe starts when part is located against faceplate stops and chucked internally. Back is faced, then grooved and chamfered, and central hole is chamfered, all in 5.2 min





Air-cylinder cap is machined . . . to mate with cylinder head by lathe fitted with hydraulically powered octagonal turret and cross-slide. Square workpiece is drilled, bored, then undercut with a turret slide tool that cams out to cutting position when it penetrates the hole far enough. Part is faced off from front of slide while turret is prevented from feeding at one position. Floor-to-floor time is 8 min; lots range in size from 500 to 20000 pc. Parts are regularly machined for cylinders from 8 in. down to 2 in.

American Machinist
Special Report No. 461 June 30, 1958



More and more today "glues with a college education" are taking over a wide variety of fastening jobs from such traditional methods as welding, riveting, brazing and soldering. Even so, knowledge of what they can do and how they can be applied is still somewhat hazy in most shops. So here is a complete, basic blueprint for adhesive usage . . .

The Production Man's Guide to

ADHESIVE BONDING METHODS

JOHN P WRIGHT, associate editor

Faster output, lower labor and material costs are the three prime reasons why adhesive bonding is today replacing welding, brazing, soldering and mechanical fasteners in a wide variety of metalworking applications.

But there are literally hundreds of different types of adhesives, each formulated to do a specific bonding job on materials that vary from ceramics to steel plate. There are many other variables involved in adhesive bonding, too—end use of the product and parts configuration, for example.

Because adhesives are just coming into 'heir own—are creating brand new production techniques as their use becomes widespread—and because of the bewildering variety of adhesives, here is a basic guide for the production man.

Adhesive bonding, or as it is sometimes called, "chemical fastening," is essentially a hand method, regardless of the quantity of parts manufactured. Only hand methods are practical, for instance . . .

. . . where the configuration of parts or of the bonding area is such that machines cannot apply the required adhesive form (powder, paste, film or liquid), or

. . . where several different sizes and shapes are manufactured in regular production, or

. . . where extensive pilot production is needed before equipment can be specified, or

. . . in small-scale or intermittent production.

SELECTING AN ADHESIVE

Three factors must be taken into consideration in choosing an adhesive: (1) method of bonding, (2) the materials to be bonded, and (3)

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Adhesive bonding tungsten carbide . . .
to the wear surface of steel periphery guides for surface grinders. Under the former method employed by SKF Industries, the two elements were brazed between 1400 to 1600 F. Because the steel expanded three times that of the carbide, thermal cracks developed resulting in high scrap loss. Now a single component, 100% reactive, solvent free modified epoxy adhesive (Rubber & Asbestos Corp's Bondmaster) is applied to the steel guide and the carbide inserts set in place and temporarily secured with tape. Entire assembly is then placed in an oven and heated to 300 F for 3½ hr

end-use requirements of the finished product (will the adhesive be subjected to excessive strain and temperature changes as in supersonic aircraft?). An adhesive should not be selected from a catalog or handbook if at all possible. Rather, the adhesive manufacturer should be consulted as to the correct adhesive for a particular application.

Most adhesive manufacturers provide a free consulting service to aid designers, production men and purchasing agents in their selection. Manufacturers' recommendations are based on current industry practice and latest laboratory findings.

Generally, industrial adhesives fall into six classifications:

- Solvent-dispersed liquids and pastes — such as rubber-base and rubber-resin-base adhesives.
- Such 100%-reactive liquids and pastes as epoxies.
- Powders such as epoxies.
- Films, e.g.: low-cost nitrile-phenolic films (for permanent bonding of flat surfaces), and pressure-sensitive adhesive films.
- Adhesive-coated copper for printed circuits.
- Water-dispersion adhesives.

Solvent-dispersed liquids and pastes are the adhesives most frequently used in hand bonding, which is done in five steps, regardless of the materials to be bonded:

1 . . . Preparing the surface

Both surfaces must be clean and dry, because adhesives bond to whatever is on the surface of the material—oil, grease or corrosion—all of which must be removed completely to achieve a firm bond.

Special care must be taken in cleaning ceramics and metals, which must be degreased, lightly abraded or chemically cleaned, thoroughly dusted and dried.

Wood must be lightly sanded, thoroughly cleaned and dried.

Mold release or plasticizer bloom must be removed from plastics or rubber with a solvent wipe, and the material dried.

Most industrial adhesives bond well to paint, lacquer, anodize and other surface finishes—providing the finish is clean, completely dry, and well anchored to the metal, wood or plastic.

2 . . . Preparing the adhesive

Adhesive must first be brought to room temperature (if it is too cold, it will be hard to spread smoothly). A 5-gallon pail of adhesive will warm up to room temperature 16 to 24 hours after being brought in from a cold warehouse; a 55-gallon drum in 24 to 28 hours. If after warming the adhesive is still too viscous, it can be thinned with solvents.

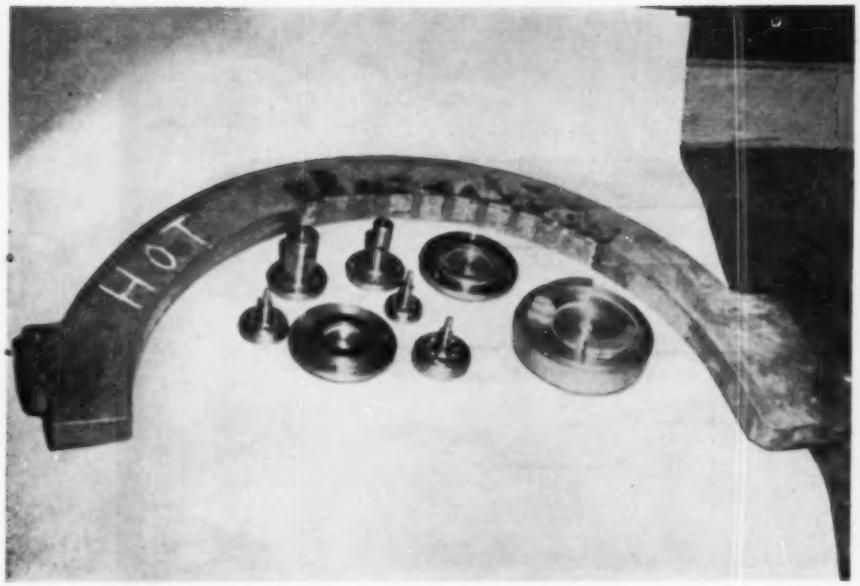
3 . . . Coating adhesive on parts

Two terms are in general usage in this stage of adhesive bonding. They are not to be confused. "Lay-down" refers to the amount of adhesive that is applied wet. "Glue-line thickness" refers to the amount of adhesive that remains after the lay-down has fully dried. For example, to achieve an ultimate glue-line thickness of 1 to 3 mils, anywhere from 5 to 15 mils of 20%-solid wet adhesive (lay-down) must be applied.

Actual coating of the adhesive on parts involves application of either a thin coat on both material surfaces, or a thick coat on just one surface. Of the two methods, the thin-coat-on-two-surfaces method generally results in longer tack life and a firmer bond.

Best hand bonding strengths are achieved, usually, when 1 to 3 mils of solvent-free adhesive remain after two smooth, flat, parallel surfaces are bonded together.

Thus the amount of lay-down de-



After curing . . .
tape is removed and bonding is complete. So effective has been the adhesive bonding of this assembly that SKF has applied it to other assemblies shown in photo

pends upon the porosity and smoothness of the surfaces to be bonded, the fit of the joint, and the strength required.

Porosity: If one or both surfaces is porous, enough liquid adhesive must be applied to fill the pores, and allowance must be made for the solvent release to achieve the desired glue-line thickness. This can be achieved by applying a thin coat of adhesive to the surface as a primer, allowing it to dry, then applying a second coat.

Smoothness: Rough surfaces must either be (1) abraded to smoothness and a light coating of adhesive applied, or (2) have enough adhesive applied to them to fill in all depressions on the surface, plus enough excess adhesive to achieve desired glue-line thickness (this can usually be done with one coat).

Fit: If the gap between two surfaces is greater than 0.001 to 0.003 in., the space must be filled with enough adhesive to make the surfaces flat and parallel within recommended tolerances. Paste adhesives are normally used to overcome this problem.

Strength: If maximum joint strength is required, not more than 0.001 to 0.002 in. dry adhesive should be used. Solvent-dispersed liquid and paste adhesives are capable of making strong bonds, but they rarely possess inherent strength. Thus stronger joints are made by filling deep gaps or depressions with such other compounds as modified epoxy adhesives, or by redesigning to eliminate the gap.

If thick layers of adhesive are required, or if 100%-reactive, solvent-free adhesives are called for, modified epoxy void-filling adhesives can be used.

4 . . . Assembling parts, and 5 . . . Allowing the bond to develop

The adhesive coat must be "tacky" when the parts are assembled (wet enough to adhere to the opposite surface). The amount of "flow" required for good adhesion is very small. Therefore parts should be assembled when the adhesive is actually in a very viscous state.

There is a limited time after coating during which solvent-dispersed liquid and paste adhesives have "tack". After this time, the "tack life" has ended, and the dry adhesive will not adhere to the opposite sur-

(Continued on next page)

ADVANTAGES OF ADHESIVE BONDING

1. There is no difficulty in bonding dissimilar materials as ceramic-to-steel.

2. In most cases, there is no need for high heats in joining.

3. Materials can be attached to very thin metal parts, far too thin for any other type of fastening, e.g., a motor stack laminate where a sprayable epoxy is used.

4. The same adhesive that bonds can also act as an oil-proof, chemical-proof, vapor-proof seal.

5. Adhesives can also contribute vibration damping properties.

6. Adhesives automatically provide heat or electrical insulating layers between two surfaces that are joined, e.g., all printed circuits made in mass production involve adhesives.

7. Bonding load is distributed uniformly over a large area as in "curtain wall" construction, wherein porcelainized metal is combined with Masonite.

8. Adhesives insure smooth, unbroken contour regardless of the thickness or intricacies of materials being bonded, e.g., preformed vinyl laminated to metal, as in TV cabinets and electronic computer housings.

9. Production costs are reduced because of less need for specialized personnel.

10. In many cases, weight can be reduced and service life increased, as in aluminum honeycomb assemblies.

11. Adhesives generally cost less than other joining materials.

12. Sturdier construction usually results.

13. Substantially less "after finishing" is required, compared with welding, soldering, or brazing methods.

14. Greater speed of assembly can generally reduce production costs as compared with those for rivets, screws, bolts, staples, and the like.

15. Lower labor costs result because of need for fewer specialized workers. Aluminum, for example, can now be bonded by semi-skilled help, thereby eliminating the danger from "burn-through". Or the brazing of an Alnico magnet to a zinc-die casting would involve considerable ability with a welding torch. Alnico-to-zinc, copper-to-steel, magnesium-to-cast-iron, all these combinations can now be bonded with an epoxy adhesive that can be applied with a brush wielded by the most inexperienced girl on the assembly line!

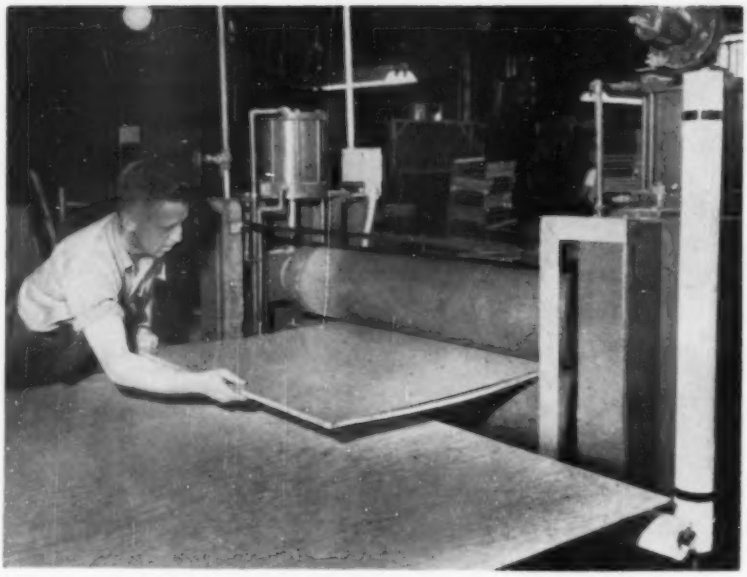
16. Adhesives often permit extensive design simplifications.

17. Lighter weight of the completed assembly means greater economy in packing and shipping.

face, even though both surfaces were coated.

NOTE: One important exception to this rule is the liquid "pressure sensitive" adhesive group which is formulated to retain almost unlimited "tack life." Such adhesives, however, do not achieve a "permanent" bond. They are primarily meant for use in the manufacture of removable labels, adhesive tapes, and decorative sheeting.

Most, though not all, solvent-dispersed liquids and pastes can be bonded either by assembling while the adhesive is still slightly wet, or by assembling by reactivating with heat or solvent after the adhesive coating has dried.



Allowing the bond to develop . . .
may be as simple as merely bringing the parts into intimate contact. Then again, bonding may require the pressure from nip rolls as shown above for honeycomb sandwich construction; or it may require both heat and pressure depending upon the kind of adhesive involved

ASSEMBLING PARTLY WET

Adhesive-coated surfaces must be allowed to dry until tacky. They are then brought into contact under firm pressure with a weighted hand roller, the palm of the hand, stacking, sandbags, metal weights, or squeeze rolls. The entire area of the materials being bonded must be kept in contact until the bond has developed enough strength to withstand stresses that might be applied to the joint in further processing.

DRYING THE SOLVENT

Drying the solvent out of the spread adhesive takes from 1 to more than 60 min., depending upon the porosity of the materials involved, thickness of the adhesive coat, strength required of the adhesive immediately after assembly, drying temperature, air flow over the adhesive surface, humidity, and solvents used in the adhesive.

Drying can be done at room temperature or by heating the adhesive-coated surface. Heat hastens the drying, saves time and floor space, and results in better bonds. Increasing the air flow over the adhesive-coated surface, with fans for instance, also hastens drying. Commonly used methods employ A. warm air from a unit heater, B. infra-red lamps, or C. hot plates.

Parts can be coated and allowed to dry while other, previously coated parts are being assembled. The number of parts that can be coated and dried while assembly is going on depends upon the production setup, quantities being manufactured, and drying time required before assembly. Alternatively, one operator can coat parts and drop them onto a conveyor, where they dry as they travel to assembly.

On damp days, moisture may condense on the surface of adhesives drying at room temperature. This tends to create poor bonds. Such condensation can be removed by heating the adhesive-coated surfaces.

ASSEMBLING BY REACTIVATING

Adhesive-coated surfaces must first be thoroughly dried. Parts may then be stocked several days in advance of the bonding operation and reactivated by one of two methods:

(1) A light coat of liquid adhesive is added to the dry adhesive, or a dilution solvent (a specific one for the dry adhesive) is applied lightly with a rag or sponge. *Solvent must be used sparingly.*

(2) Or the dry adhesive layer can be heated with infra-red lamps, hot air or a hot plate to the reactivation temperature of the specific adhesive. These temperatures usually range from 180 to 400 F.

Still another method of reactivation, emloyed when swifter bonding is desired, involves positioning the dry-adhesive - coated components, then bonding them by applying heat and pressure. Because tack life is very short when the adhesive is reactivated by this method, parts must first be positioned accurately.

It is important that the adhesive layer be heated to its exact reactivation temperature. Because of this, enough heat must be applied to compensate for any heat loss that might occur from the insulating properties of the materials that are being bonded.

One type of adhesive that does not require a chemical solvent is the water-dispersion latex cement, which costs comparatively little, eliminates fire hazards. These cements are either reclaimed rubber and asphalt water dispersions, vinyl emulsions, or milk latex. They are applied either by spraying or roller coating, and their body and consistency may be varied to accommodate different applications. One of the largest applications of these cements today is for attaching sound-deadener pads (paper, felt, glass fiber) to automobile bodies.

EXCEPTIONS TO THE RULES

Two other types of solvent-dispersed liquid and paste adhesives have tack characteristics differing from those already described:

First are so-called "contact bond" adhesives, which while they can be applied by the same methods as the adhesives previously described, are specifically formulated to adhere to themselves at room temperatures for a given period of time after drying. Their most widespread use is in bonding decorative laminates.

(Continued on page 90)

A General Guide to COMPARATIVE CHARACTERISTICS OF TYPICAL METAL-BONDING ADHESIVES

	Chemical Family[1]	Typical[2] Application Methods	Typical Cure Cycle Ranges			Comparative[3] Peel Strength	Average Shear Strength Values in psi[4]				
			Temp F	Pressure, psi	Time		–67 F	75 F	180 F	250 F	350 F
GROUP I[5] HIGH STRENGTH	Nitrile Phenolic	Spray; brush dip; roll coat by hand	300-400	25-200	30-180 min	Very Good	1500-2500	2000-3500	1000-1500	800	200
	Epoxy	Brush; trowel; knife coat; dip; dust	70-90 or 140-535	contact contact	8 hrs-7 days 3-120 min	Poor	2000-4000	2000-4000	1500-4000	1500	500
	Vinyl Phenolic	Spray; brush; dip; knife coat by hand	275-350	50-200	20-180 min	Good	2000-4000	2000-5000	1500-4000	500	200
GROUP II MEDIUM STRENGTH	Neoprene	Spray; brush; dip; roll coat	70-90 or 240-320	contact	—	Very Good	—	—	Good	—	—
	Phenolic and Resorcinol Phenolic	Brush; dip; knife coat	70-350	contact	—	Poor	—	—	Good	—	—
	Polyester	Brush; dip; knife coat	260-340	contact	—	Poor	—	—	Good	—	—

FOOTNOTE 1:
Chart indicates a general range of comparative characteristics of typical metal-bonding adhesives arbitrarily classified under six chemical families of formulations. Obviously, various design considerations will substantially affect attainable values. In addition, modern adhesives technology involves the combining of various chemical families (phenolics and epoxies, for example) to achieve certain desired end-use characteristics. For these and other reasons, the values indicated above should be used as a general guide, only, and reference should be made to the individual adhesive manufacturer's detailed technical data sheet that will give more specific information.

2:
Most adhesive manufacturers can provide formulations in a choice of viscosities to achieve maximum efficiency for the particular application method desired by the user. Some epoxies, for example, exist as trowelable mastics, heavy pastes, light pastes, liquids, powders, and films.

3:
Average values of typical formulations are indicated. Specially formulated variations can be produced by the adhesive manufacturer to attain desired service characteristics. For example, several flexibilized epoxies exist as standard products.

4:
Average shear strength values of typical adhesives in each chemical family are given here. In addition, various specialized formulations exist (for the aircraft industry, for example) that will maintain full strength in continuous service at high heats or that have been developed to favor a specific, pre-determined service temperature range.

5:
Strength values in this group of adhesives are less dependent upon the nature of the materials being bonded than is true of Group II. For example, some formulations within these chemical families feature specific adhesion to a wide spectrum of raw materials: all kinds of metals; wood; rigid, flexible, and foamed plastics. This is not true of many of the formulations within the chemical families listed in Group II.

Second, pressure-sensitive adhesives are so formulated as to adhere to almost any surface for an almost indefinite period after application. They, too, can be applied by methods previously described.

CHEMICAL FASTENING FOR MASS PRODUCTION

In these days of automation and mechanized materials handling, process engineers are prone to overlook the tremendous amount of hand mass production in industry. It is in many instances still the most efficient, economical and flexible way to create a product, and it appears that most of such mass production handwork is here to stay—particularly chemical fastening with industrial adhesives.

ADHESIVE BONDING VS OTHER BONDING METHODS

Let us first compare the basic principles and differences between welding and adhesive bonding. A welded, brazed, or soldered joint actually employs metal as a bonding agent. These metals are generally much stronger and tougher than such organic materials as wood, fabrics and adhesives, and thus produce a much stronger joint.

A properly welded joint automatically produces good shear, peel and impact strength—strong enough to meet almost any end-use. Thus strength is generally not a major consideration in welding metals together.

But strength is a very important consideration in adhesive bonding, and cannot be taken for granted. An adhesive so formulated as to yield high shear strength may not necessarily have a high peel strength.

Adhesive "A," for instance, can differ from Adhesive "B" in heat-resistance as much as aluminum differs from stainless steel, and in impact resistance as much as do lead and cast iron.

Here, the reference is to *degree* of strength, not to kinds of application. The type of metal to be bonded with adhesives makes little difference, if any. For instance a specific adhesive can be used regardless of whether it is to bond dissimilar metals, metal to plastic, plastic to plastics, ceramics to metal, or almost any two materials used in industry today.

Unlike welding rods and electrodes, adhesives for metal bonding come in various physical forms and can be applied in many different ways.

With adhesive bonding, unlike welding, it is as easy to bond aluminum or magnesium to stainless steel or cast iron as it is to bond cast iron to itself and aluminum to itself. In bonding any two metals, exactly the same adhesives, heat (or lack of heat), and just about the same techniques are employed, except for precleaning procedures.

When adhesives are employed, regardless of which metals are worked, there is complete freedom from burn-through, post-cleaning, flux removal, danger of embrittlement, galvanic action, corrosion and all other problems involved in welding, soldering and brazing.

Solvent-dispersed adhesives (for bonding metals and other rigid materials) come in a wide variety. Generally they contain an elastomer (rubber or vinyl butyral), which adds to the adhesive's flexibility, extensibility and peel strength, and a thermosetting synthetic resin. This resin may be of the epoxy type, a phenolic, or a polyester (alkyd).

Much higher flexibilizer concentrations can be built into solvent-dispersed compositions than into paste epoxy-resin adhesives.

Paste (100% solids) modified epoxy adhesives provide high shear, high temperature, and high creep strengths—plus superior electrical properties.

Solvent - dispersed compositions generally provide better peel strength, stretch and impact properties.

Peel and shear strengths of rigid organic adhesives vary widely—just as they do with concrete, where the direction of the pour has a great effect on ultimate strength. The adhesive must therefore be carefully selected and the joint designed for greatest strength. Adhesives with needed strength characteristics and the right viscosity are available for almost all applications today.

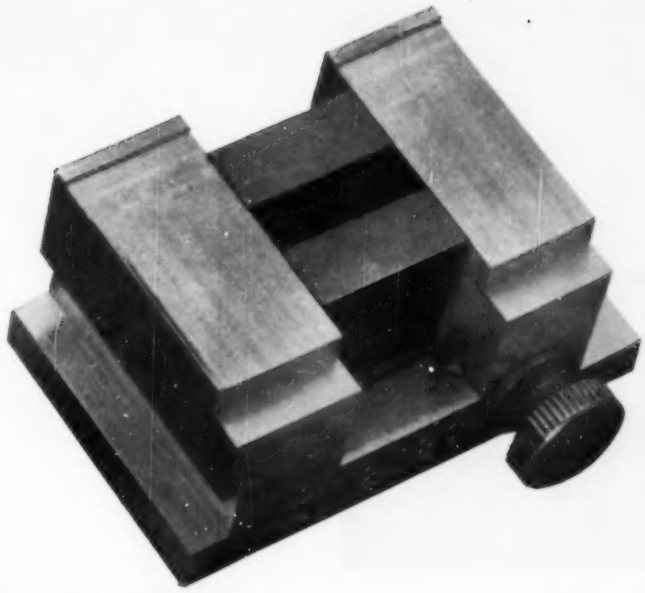
Selection of an adhesive should be based upon six factors:

1. Time and temperature needed for curing.
2. Hot strength of the completed bond. How much load will it stand at elevated temperatures? Remember, they're all excellent at room temperature!
3. Shear strength.
4. Peel strength. There's a whale of a difference between shear, and peel strengths.
5. Impact strength.
6. Solvent and chemical resistance (to acids, alkalis, humidity, other external attack).

As a general rule, if an improved hot creep strength is desired, (ability of the completed bond to maintain its strength under continuous structural loads at high temperatures) it becomes necessary to cure

Test	Typical Values, Results	Required by Specification MIL-A-5090B
Std Temp Shear Strength	3770 psi	2500 psi min
180 F Shear Strength	3366 psi	1250 psi min
–67 F Shear Strength	3173 psi	2500 psi min
Std Temp Creep-Rupture Strength (Deformation)	No failures 0.0008 in.	0.015 in. max
180 F Creep Rupture Strength (Deformation)	No failures 0.0005 in.	0.015 in. max
Std Temp Bond Strength	189 lb	150 lb min
30 Day Salt Spray Shear Strength	3210 psi	2250 psi min
30 Day Water Immersion Shear Strength	3200 psi	2250 psi min
7 Day Immersion in Anti-Icing Fluid	3739 psi	2250 psi min
7 Day Immersion in Hydraulic Fluid	3754 psi	2250 psi min
7 Day Immersion in JP-4 (Jet-Aircraft fuel)	3653 psi	2250 psi min
7 Day Immersion in Hydrocarbon Fluid	3834 psi	2250 psi min

Test data . . .
indicates how a 100%-reactive, epoxy based, solvent-free adhesive bonded aircraft sandwich construction surpassed the minimum MIL-A-5090B specifications. Test was conducted to determine the reliability of R&A's Bondmaster M602/M611 adhesive system



Adhesive replaces solder . . .
in magnet bonding. The 100% reactive, room temperature curing epoxy adhesive (Bondmaster M688) yields higher strength than the solder formerly used, and at the same time eliminates all danger of burn through of the aluminum and disorientation of the magnet. The adhesive sells at less than $2 per pound in production quantities

the adhesive at a temperature between 250 and 350 F. If the application won't permit a heat cure at that temperature level, then a compromise will have to be made to achieve desired hot strength characteristics.

Similarly, if more peel strength is desired, then chances are it will be necessary to sacrifice some of the heat-resistance to reach a happy medium.

Of course, there's a way to lick this problem too—by using both types of adhesives. (This technique is extensively used in the aircraft industry where a specially formulated primer prepares the opposing metal surfaces for the final bonding adhesive and introduces a more flexible, shock- and peel-proof layer in contact with the metal.)

Take for example the bonding of aluminum for radar antennas. Radar antenna assembly is further complicated because it must be done at room temperature. This means that a solvent-dispersed, two-part flexibilized epoxy is used as a primer, and followed with a two-part high-shear-strength paste epoxy, also room-temperature cured.

Added to these formulations is a thixotropic agent that eliminates all sagging and flowing of the adhesive, and keeps it exactly in place where it is laid down.

Two other adhesive groupings should be considered—adhesives that flow, and adhesives that don't flow.

Adhesives will normally flow rather freely when subjected to heat. Accordingly, even a very-heavy-paste-viscosity adhesive will flow and run freely when it is subjected to heat cure.

In most applications this is an advantage. The free flow gets into places that can't be reached when applying the adhesive, and evens out the glue line.

However, some applications demand an adhesive that doesn't flow. This demand could be based on certain "gap-bridging" characteristics, or a need to restrict adhesive to the exact spot where it is put, so that there is absolutely no post-finishing operation required. Then again, the adhesive may have to be applied vertically or over-head. Then the ability of the adhesive to stay in exactly the same spot without sagging is an outstanding advantage.

PRESSURE

One of the important distinguishing characteristics of a 100% solids epoxy formulation is that no pressure beyond that required to hold the parts in contact and position is needed to effect the bond. However, it may be necessary to jig the materials being handled so as to hold them in position until the bond is effected. This elimination of the need for pressure, however, is not true of "non-epoxies." Generally (and there are many exceptions), the higher the pressure applied to the assembly, the higher the strength of the completed non-epoxy bond.

VALUE ANALYSIS

A great many engineers whose work involves joining metals—particularly those who have spent a lifetime with welding, soldering, brazing, and similar techniques—appear to have lost track of the meaning of the word "strength."

To make maximum use of all the many different and unusual advantages that adhesives offer in metal-bonding, it pays to be realistic about strength requirements. Don't look for more strength than you actually need for the job at hand. When bonding components that will themselves be destroyed if subjected to 2000 psi shear, don't look for 5000 psi in the adhesive.

Such an adhesive is available, but it comes high one way or another—sometimes in material cost—sometimes in labor cost— sometimes in production speed. Allow as much of a safety factor as needed, but don't, arbitrarily, go for the "highest possible strength" adhesive for the application. Selection of such an adhesive when not needed may result in sacrificing other characteristics of the bond to achieve a higher shear strength that isn't important to the application.

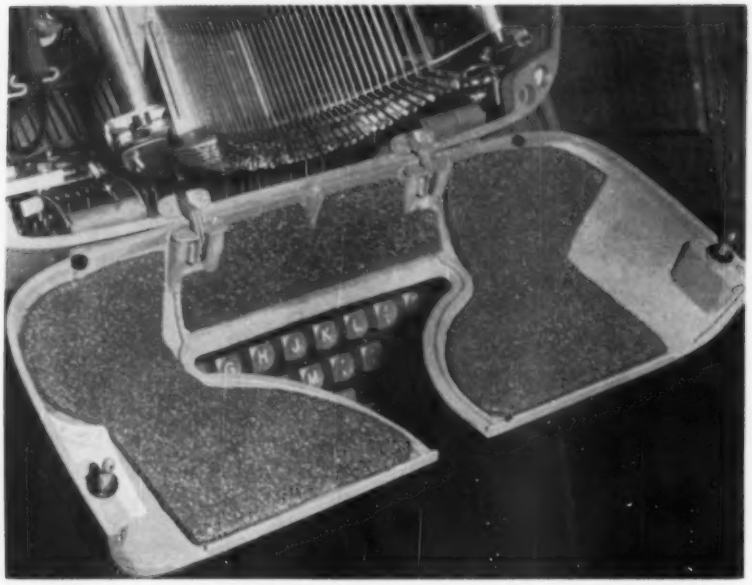
This is even truer with heat-resistance. If the finished assembly is expected to operate at ambient temperatures, don't insist upon an adhesive that passes a test involving sustained loads at 350 F. *There are no added advantages to be obtained by overdesigning.*

HERE ARE A FEW COST-CUTTING ADHESIVE APPLICATIONS

• Conventional method of fastening nameplates involves drilling, countersinking for mounting screws, or drilling for nuts and bolts; or use of speed fasteners, or rivets.

Adhesive method: Pre-dried adhesive on the back of nameplates of thin aluminum foil, heavy steel, or plastic is reactivated by a wipe with a solvent-dampened cloth. The nameplate is then applied to metal, wood, or plastic cabinet and bonds instantly. Within a matter of a day or so, a screwdriver can't pry it loose without destroying it.

• Here's an alternate method em-



Polyurethane foam for sound-deadening . . .
is applied to electric typewriters with a non-flammable adhesive specifically formulated for this manufacturer

ploying a dry-film adhesive: A fiberglass mat that has been impregnated with a liquid adhesive, is cut to size with scissors, or die cut to whatever shape is needed. The dry adhesive can be reactivated with a liquid adhesive, wiped with a solvent-moistened rag, or laid dry between any two flat surfaces and reactivated with heat and pressure.

For example the Navy is evaluating solvent-reactivating dry film to bond steel plates to steel decks and walls instead of using rivets. Bond is tested by applying a blow torch to the back of the wall then attempting to pry the plates loose with a pry-bar.

• Bonding Alnico magnets to any metal involves highly trained, skilled torch manipulators working with costly silver solders. Application temperatures in excess of 1000 F create the possibility of embrittlement and distortion, because of different coefficients of expansion. There is also the danger of changing magnetic qualities because of heat and unrelieved mechanical strains, plus the possibility trapping the corrosive soldering flux.

Even qualified welders, who are expert enough to avoid these hazards, still find it difficult to maintain uniformity, unit after unit.

Today, in many plants, Alnico magnets are assembled with a ready-to-use, "no-mix," epoxy adhesive. In production quantities, this adhesive costs about $2 a pound, compared with $18 a pound for silver solders.

The B-58 has adhesive bonded structures for approximately 95% of the aircraft structure. Early in the preliminary design phase, approximately 2 dozen different designs of skin coverings were evaluated, fabricated, and tested to determine which type would be optimum for use on the B-58. In the final analysis, only adhesive bonded structures presented all of the desired advantages. These advantages included aerodynamic smoothness, high structural efficiency, simplicity of design resulting in lower costs, improved fuel sealing and insulation from aerodynamic heating, resistance to sonic fatigue, elimination of many sub-assembly operations and standardized fabrication for a large portion of structural aircraft components.

PROBLEMS ASSOCIATED WITH USE OF ADHESIVES IN INDUSTRY

A high degree of quality control and testing is required to determine whether or not the adhesive meets specifications when such specifications are critical. Changes in production techniques are required and these changes affect design concepts and allowables, methods of analyses, tool design, processes, inspection techniques, manufacturing methods, and facilities.

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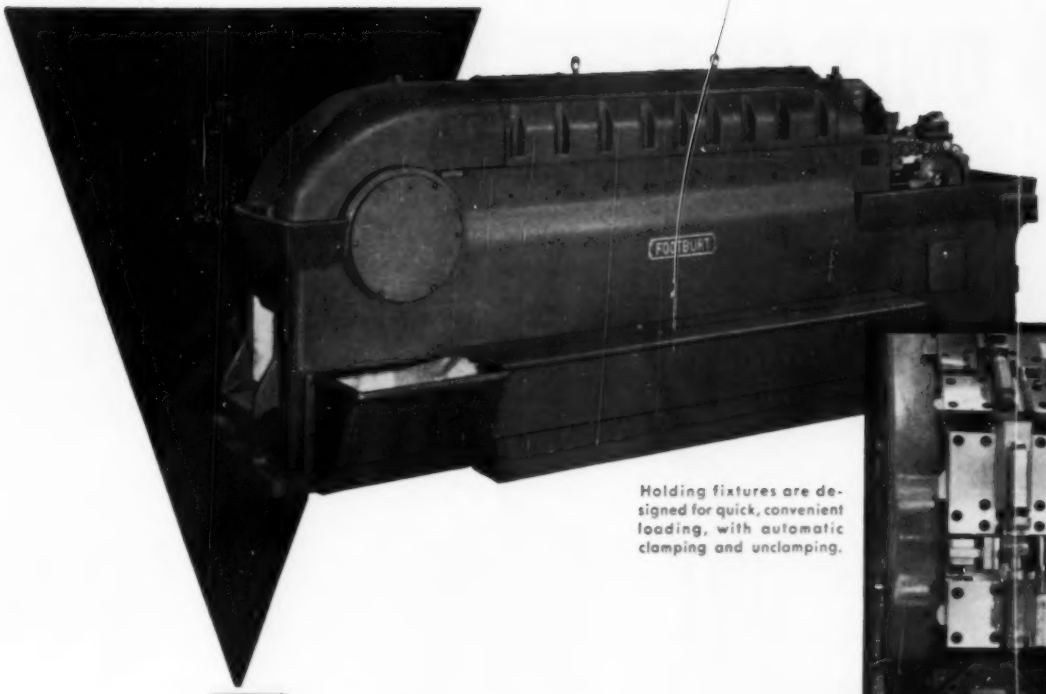

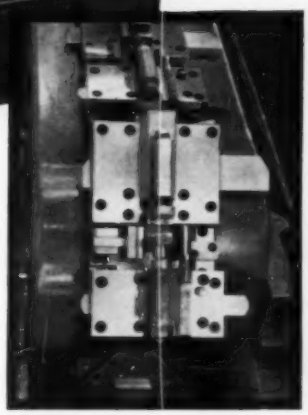

Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

LOWER COST . . . PER PIECE WITH SURFACE BROACHING OF SMALL PARTS

In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching, in many fields.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio

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ENGINEERED FOR PRODUCTION

Write for Circular No. 503

FOOTBURT

PIONEERS IN SURFACE BROACHING

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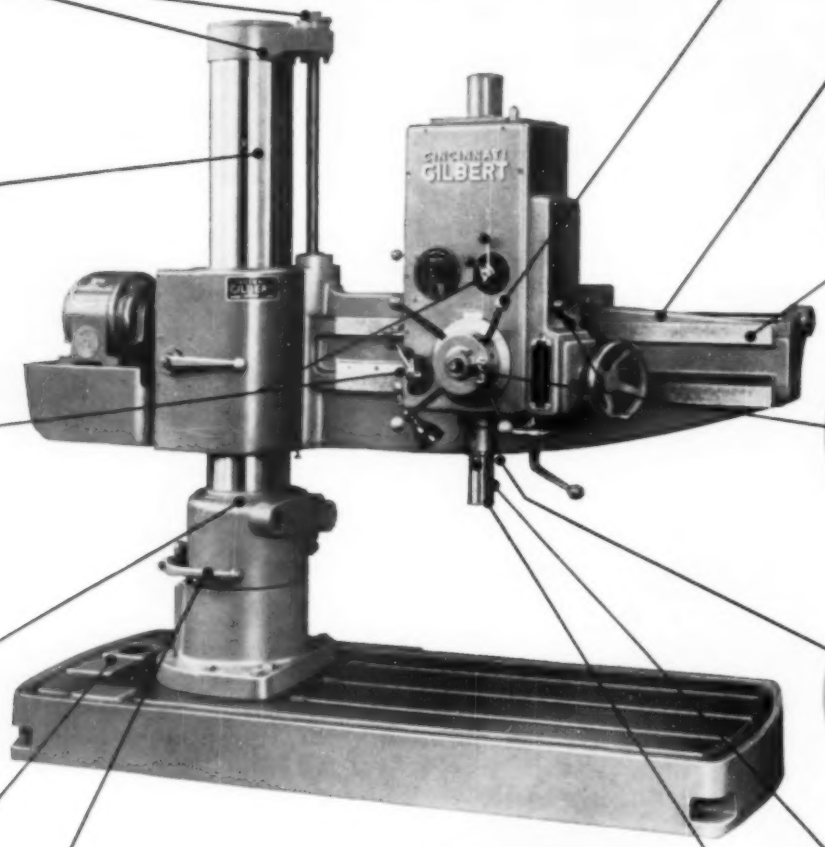

Safety elevating nut protects both operator and machine

Weight carried on opposed Timken bearings

Hardened column available

Direct-reading speed and feed shifters; gears counterbalanced for easy shifting

Adjustable ball bearing rollers on hardened ring for maintained rigidity

Long heel on heavy base provides 360° stability

Powerful, accurate electric column clamp available

Four-lever turnstile cuts machine handling time

Balanced arm resists torsion, compression, tension forces

Head rides on anti-friction bearings; clamps three surfaces

When disengaging positive feed clutch, spindle won't drop

Full spindle support near tool; runout is less than .001"

Hardened tang slot is an exclusive Gilbert feature

You can always see the spindle; get extra use of spindle travel

And don't overlook these additional features:

- wide range of spindle speeds for efficient tool performance;
- hardened gears throughout the machine;
- standard or special tap leads available;
- modern styling which reduces housekeeping, convinces customers that your shop is up-to-date.

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those who buy Gilbert buy Gilbert again

THE CINCINNATI GILBERT MACHINE TOOL CO.
BEEKMAN STREET, CINCINNATI 23, OHIO

American Machinist
REFERENCE BOOK SHEET

Geometric and Positional Tolerancing—IV

WALTER H HARRINGTON,
engineering standards coordinator,
Avco Research and Advanced Development Div,
AVCO MFG CORP, LAWRENCE, MASS
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Straightness is a condition where an element of a surface does not deviate from a straight line. Fig. 10 illustrates how straightness of the piece may vary. If it is desired to limit amount of deviation from a straight line of the elements of a prismatic or cylindrical surface, or of the true axis of a cylindrical surface, a tolerance must be specified. If no straightness tolerance is specified, the piece may be of any shape so long as it stays within the zone between two cylinders 1.500 and 1.490 in. in diameter, which need not be concentric as long as the smaller is contained entirely within the larger.

The tolerance specification merely reduces size of the tolerance zone within which all points on the surface must lie.

All notations in Fig. 11 are interpreted to mean the same thing; i.e., that any element of the surface must not vary from a straight line parallel to the main axis by more than the amount of tolerance. Fig. 12 illustrates straightness tolerance applied to a bar as a general rule.

Parallelism (Fig. 13) is a condition in which two or more planes or straight lines extend in the same direction and are equidistant at all points. The tolerance governing parallelism of two surfaces, axes or axial planes with relation to each other is the width or diameter of the tolerance zone within which the relevant surface, axis or axial plane must lie.

All notations in Fig. 14 have the same interpretation, although the SAE note "within 0.002" might be interpreted as a bilateral dimension, that is, a tolerance zone 0.004 in. wide. Figs. 15 and 16 illustrate interpretations which would be acceptable within definitions and specifications of parallelism.

Perpendicularity (Fig. 17) is the condition of surfaces or lines

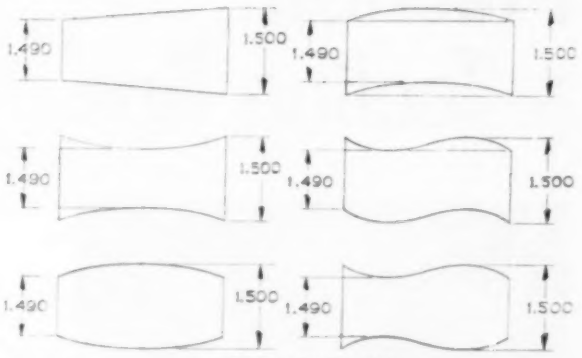


FIG. 10 STRAIGHTNESS

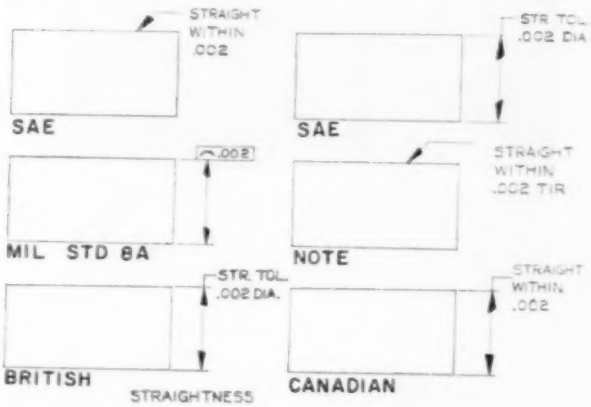
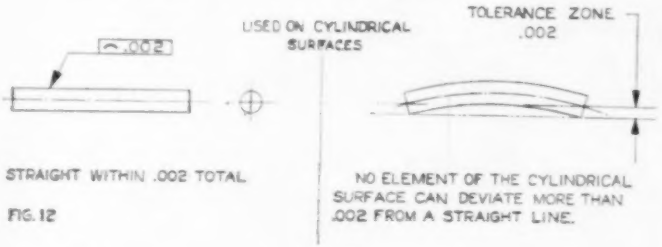


FIG. 11 STRAIGHTNESS

THIS ON THE DRAWING MEANS THIS



STRAIGHT WITHIN .002 TOTAL

NO ELEMENT OF THE CYLINDRICAL SURFACE CAN DEVIATE MORE THAN .002 FROM A STRAIGHT LINE.

FIG. 12

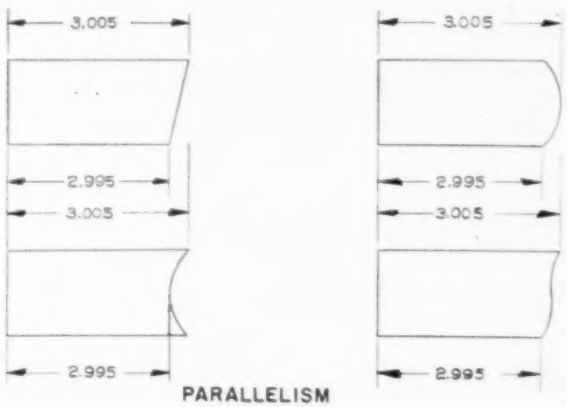
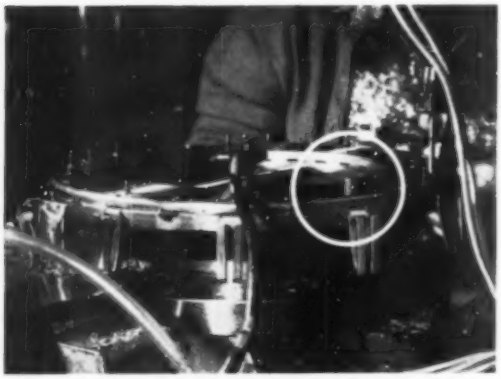


FIG. 13 PARALLELISM

Practical Tooling Tips

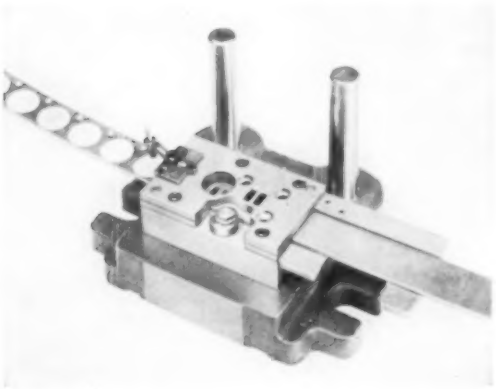
No. 3 of a series

Are your tool makers wasting time making complicated tooling gadgets when a standard, off-the-shelf Vlier part could do the job much better? Why not examine your present drawings and see where these simple, low-cost parts can be used. You will be amazed at the savings possible.



PRODUCTION INCREASED 300% when this 12-station automatic indexing and tapping fixture was put to work. Vlier Spring Plungers allow the operator to load by simply pushing the part into a slot. These simple, spring-loaded tools also position the part for the tapping operation. Available in four models; fifty sizes.

NEW SWIVEL PAD-TORQUE THUMB SCREW combines the Vlier Torque Thumb Screw and Swivel Pad Clamp. The result is a perfect holding tool—one that applies only the right amount of holding pressure without damaging the finished surface. Unique ball joint construction of the pad permits adjustment to off-angle surfaces.



PROPER STOCK ALIGNMENT IN PROGRESSIVE DIES becomes a simple task with the new Vlier Stock Pusher. Saves pilots. Mounts in tapped hole. Accommodates stock as thin as .010"; width variations totalling 1/16". Nothing to wear out or foul up.

NEW 1958 CATALOG NOW AVAILABLE—Eight pages; completely revised. Includes information and specifications on all new Vlier products, including the Torque Handle, Stock Pusher, Leveling Pad. Makes ordering easy. Suggests new uses for these proven time-savers. Write for your copy today!

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Geometric and Positional Tolerancing—V

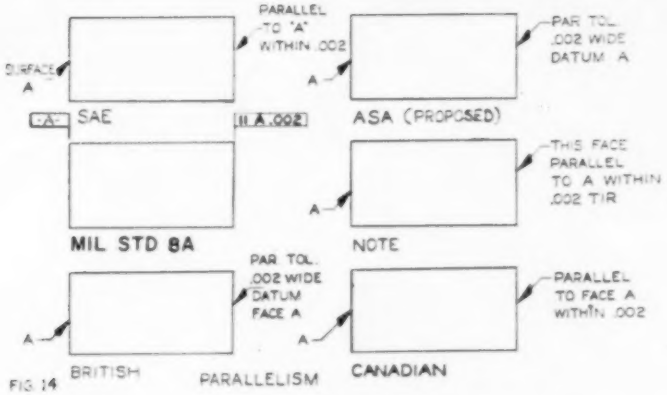


FIG. 14

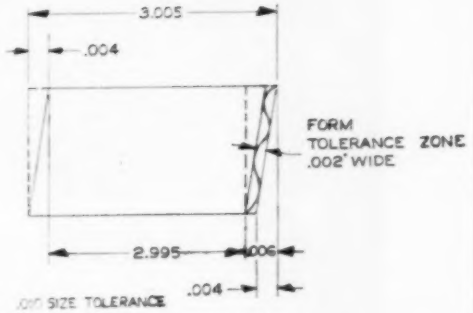


FIG. 16

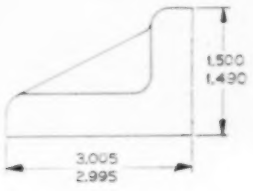
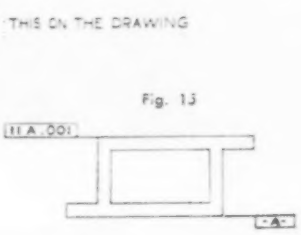
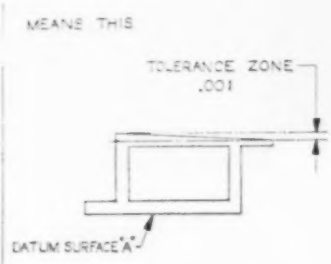


FIG. 17 PERPENDICULARITY





ALL POINTS ON THE SURFACE MUST LIE WITHIN TWO PLANES .001 APART AND PARALLEL TO THE DATUM SURFACE "A"

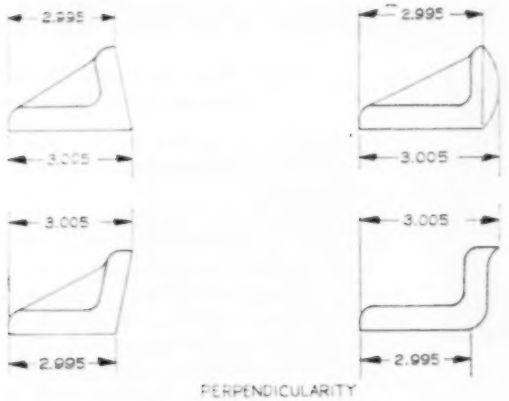


FIG. 18 PERPENDICULARITY

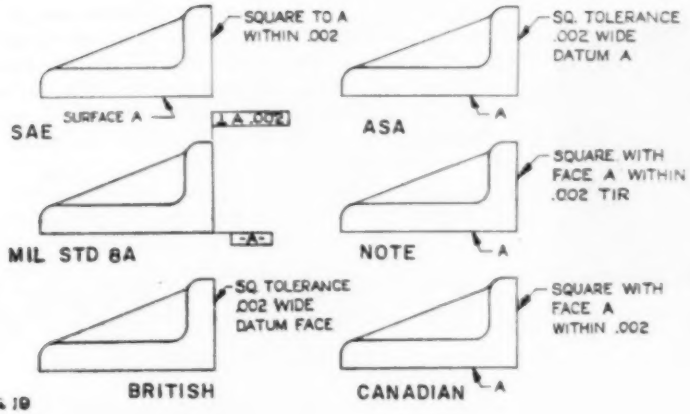
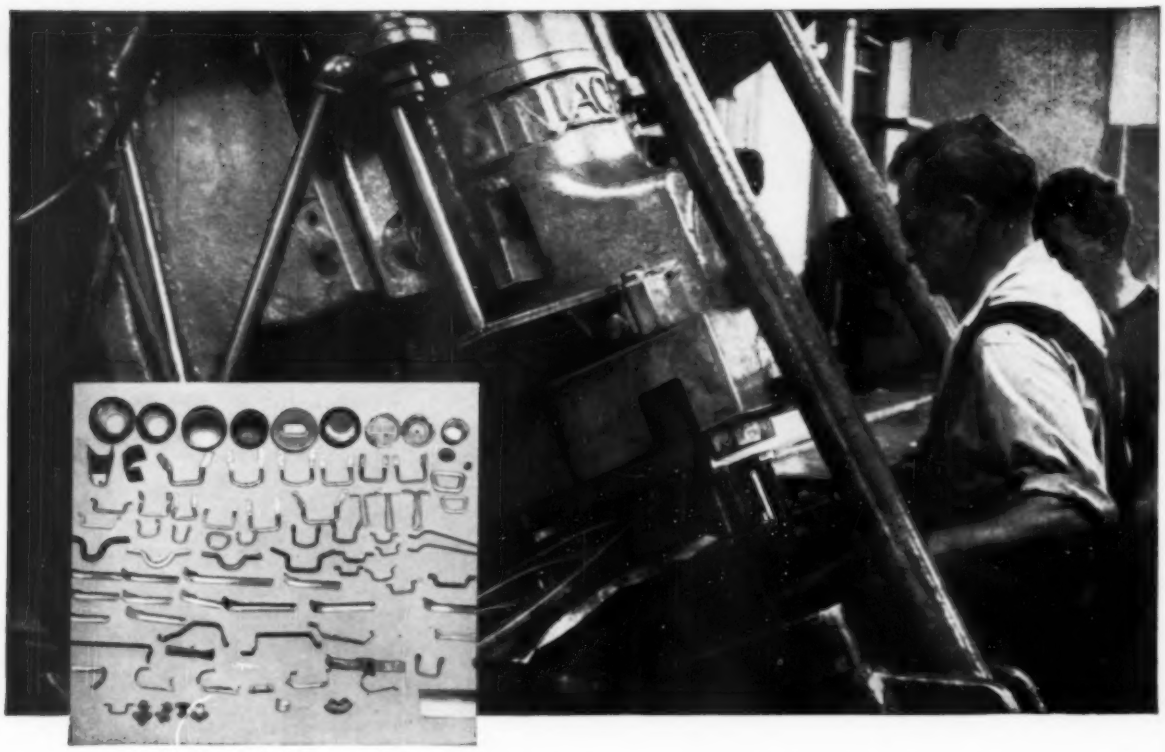


FIG. 19

which are at right angles to each other. It is generally assumed that all surfaces not covered by a special note are square with the datum within any standard tolerance or limit dimension specified on the drawing. Further, it is assumed that this tolerance applies to the outermost edge of the surface, expressed by giving the total permissible indicator reading. Fig. 18 illustrates variations permissible within these conditions. The tolerance governing perpendicularity of surfaces, axes or axial planes, with relation to each other is the width or diameter of the tolerance zone within which the relevant surface, axis or axial plane must lie.

Notations in Fig. 19 are all interpreted the same; i.e., that the variations of the surface are all contained within a zone 0.002 in. wide perpendicular to the datum surface and located within the tolerance zone defined by the limit dimensions (Fig 20).

Angularity is the condition of surfaces or lines which are at an



"We stamp them all using just 2 Cities Service Oils!"

Presses shift to numerous operations without ever changing oil, thanks to versatility of the 2 Cities Service oils used for all jobs.

Handles by the thousands are produced by Res for cooking utensils and similar items. Finish is excellent, thanks to Cities Service oil.

...says Res Manufacturing Company Milwaukee, Wisconsin

It's doubtful if anyone makes a more diversified line of stamped and formed metal products than Res Manufacturing Company.

With its 21 presses, ranging from 15 to 200 tons capacity, Res turns out millions of articles a year . . . wire handles, metal handles, wire forms, drawn shells, lifting loops, and parts for electrical controls, to mention just a few.

"All require the best possible finish and all get it with the use of just two Cities Service oils," says Assistant Plant Manager Herbert W. Krueger.

"For drawing, shaping, and punching aluminum, we use Cities Service Chillo #2 with excellent results. Where drawing, swedging or forming of steel and brass is required, we use Cities Service Chillo 12 and get equally fine results.

"Not only do these two Cities Service oils handle all our jobs and produce the best possible finish, but we also find they increase tool life and hold scrap to a minimum. In short, these are the best oils we have ever seen."

Like Res Manufacturing, chances are your operation can be simplified with the right Cities Service oils. Talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Geometric and Positional Tolerancing—VI

angle to each other. In the common method of tolerancing angular surfaces by placing the tolerance on the angle (Fig. 21), the tolerance zone varies from zero and becomes wider as the distance from the apex of the angle increases. This method of stating requirements may allow parts to vary outside desired limits; or manufacturing operations to meet requirements may not be possible.

The method of linear limits is better suited for the majority of angular features and also allows the angle to vary from the basic value. The tolerance governing angularity of surfaces with relation to each other is the width or diameter of the tolerance zone within which the relevant surface must lie. The angular tolerance notations illustrated in Fig. 21 are all interpreted to mean that the relevant surface must lie within a tolerance zone 0.002 wide, bounded by two planes, both of which make the basic specified angle with the datum surface.

A question arises: "How can the machinist measure his tolerance, or check his cut of 45° in thousandths, when his machine is calibrated in degrees?"

And a machinist has provided the answer: "The only possible way to measure and check the angle tolerance is by measuring the two coordinates."

For checking, a sine bar and straight edge must be employed.

Concentricity (Fig. 22) is a condition in which two or more regular features, in any combination, have a common axis. The tolerance governing concentricity of axes is the diameter of the tolerance zone within which the axes of the concentric features must lie.

It is generally assumed that all circular surfaces not covered by a specific tolerance are concentric within any general tolerance specified on the drawing. In most cases, concentric surfaces generated on common centers in manufacture will be concentric to a degree of precision more than adequate for functional requirements, and tolerances will be easily maintained.

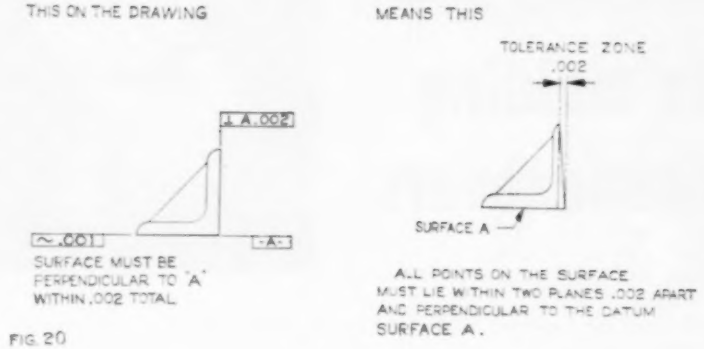
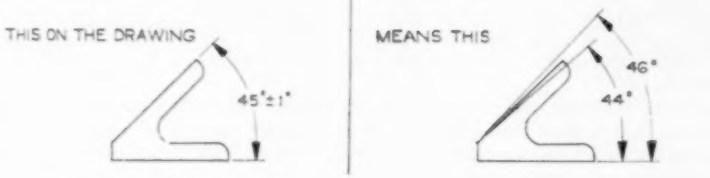

THIS ON THE DRAWING
MEANS THIS
⊥ A .002
⌓ .001
-A-
SURFACE MUST BE PERPENDICULAR TO "A" WITHIN .002 TOTAL
TOLERANCE ZONE .002
SURFACE A
ALL POINTS ON THE SURFACE MUST LIE WITHIN TWO PLANES .002 APART AND PERPENDICULAR TO THE DATUM SURFACE A.

FIG. 20



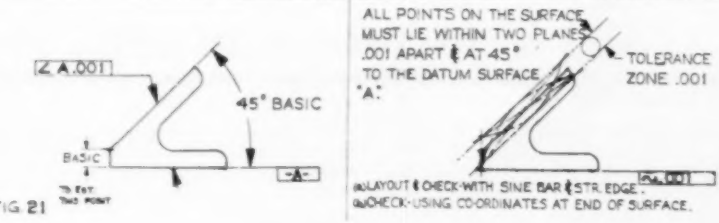

∠ A .001
45° BASIC
BASIC
-A-
TO FAT THIS POINT
ALL POINTS ON THE SURFACE MUST LIE WITHIN TWO PLANES .001 APART ∠ AT 45° TO THE DATUM SURFACE "A".
TOLERANCE ZONE .001
⌓ .001
@LAYOUT & CHECK WITH SINE BAR & STR. EDGE.
@CHECK USING CO-ORDINATES AT END OF SURFACE.

FIG. 21

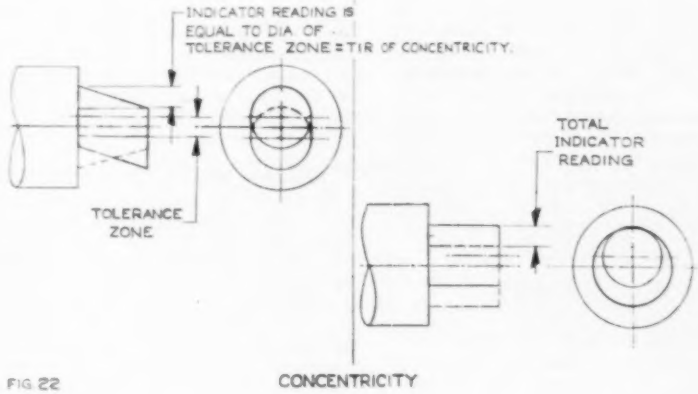

INDICATOR READING IS EQUAL TO DIA. OF TOLERANCE ZONE = TIR OF CONCENTRICITY.
TOLERANCE ZONE
TOTAL INDICATOR READING
CONCENTRICITY

FIG. 22

Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor Bethlehem Steel Export Corporation

Lustre-Die held costs down in molding plastic covers

"We need," said the customer, "a plastic cover to protect our sealed motors. It's to be drip-proof and sturdy, yet must be a low cost item. Do you have a grade of die steel which will help us produce such a cover economically?"

The mold maker, Dollins Tool & Gage Co., Independence, Mo., put the problem up to Ford Steel Co., St. Louis, our local tool steel distributor. Quick as a flash came their recommendation: "Lustre-Die!"

The electric-furnace steel performed to everyone's satisfaction. It was economical. It took a high polish. It had high compressive strength. It machined easily. It performed well in molding the parts which were held to a close tolerance of .001 in.

Lustre-Die is just the ticket for molding plastics because its properties make possible a bright, mirror-like polish. Lustre-Die has the proper basic analysis for molding plastics. And it offers something more — alloy fortification! Lustre-Die is heat-treated by oil-quenching and tempering to augment its properties, and is furnished ready for machining and polishing.

Lustre-Die is carefully inspected to insure cleanliness. It is free from injurious porosity or surface pitting. And there's no problem about inclusion-causing additions.

Lustre-Die is a good steel to keep in mind for your next plastic-molding operation. Your Bethlehem tool steel distributor can furnish it from stock. Why not give him a call?

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Here's Why Air-Hardening Steels are Good Performers

When a large group of various types of tools made from air-hardening tool steels is compared with a group of similar tools made from steels which require liquid quenching for hardening, it will be found that the air-hardened tools outperform the liquid-quenched tools in service. This result will not necessarily be found in the comparison of individual tools, but will appear if a large enough variety and number of tools are studied.

The reason why air-hardened tools outperform liquid-quenched tools can be summed up in one word — consistency. The consistent performance of air-hardened tools is evident in many ways:

DIMENSIONAL STABILITY

All tools, when subjected to the hardening operation, develop small but measurable dimensional changes (so-called distortion). Air-hardened tools not only show less dimensional change than liquid-quenched tools, but the changes that do occur are remarkably similar in each tool when identical tools are made up. By contrast, liquid-hardened tools show considerably more variation from tool to tool when identical tools are produced.

HARDNESS

Duplicate air-hardened tools invariably show the same hardness after heat-treatment. Liquid-quenched tools may show erratic hardness in various locations on a tool, due to variations in effectiveness of the liquid quench; however, duplicate tools will each have a somewhat different hardness pattern.

RESIDUAL QUENCHING STRESSES

All tools develop residual internal stresses due to the hardening operation. Liquid-quenched tools develop high internal residual stresses because of the variations in cooling rate which occur in different locations on a tool during the quench. If improperly controlled, these stresses can lead to cracking of the tools in heat-treatment or in grinding, or the load-carrying ability of the tools may be low and erratic.

By contrast, air-hardened tools develop only a low degree of internal stress during hardening, because of the comparatively uniform cooling in the quench. Furthermore, the degree of internal stress which develops is uniform from tool to tool, so that the service performance of duplicate tools is reasonably consistent.

The advantages of air-hardening steels cannot be realized, however, unless they are hardened by air-quenching. It is possible to harden all air-hardening steels by liquid-quenching (oil-quench or salt-quench as in martempering) and this is frequently done because of the convenience of existing heat-treatment equipment. However, liquid-quenching of air-hardening steels is a serious mistake, because it sacrifices almost all the basic advantages of air-hardening steels. Liquid-quenching not only increases distortion and internal stresses, but may lead to cracking of some of the tools during heat-treatment. Air-hardened steels which are properly quenched in air do not crack in heat-treatment.

Bethlehem offers a full range of air-hardening steels: Bearcat for shock applications, A-H5 for general-purpose tool and die work, and Lehigh H for maximum production runs.

Talking Shop...

The Price of Eggs

ANY CONNECTION between the metalworking industries and the price of eggs may seem far-fetched. But we have seen a new film that uses just such a connection to teach an important lesson about production and to teach it as effectively as anything of the type we've ever seen.

Imagine, if you can, a farmer who sells eggs at three prices: yet all the eggs are the same size, quality, and degree of freshness. Silly? That's what the hero of the picture thinks until he encounters an identical situation in his own business: he can produce identical parts at two different prices on two machines in his plant, and at still a third price on a new machine.

The complex arithmetic usually associated with replacement formulas has been simplified and presented in animated form.

Because the film manages to generate a surprising degree of suspense in dealing with its subject, we'll follow the practice of any good film reviewer and refrain from telling you how it all comes out, but we do want to urge you to make a special effort to see this 17-minute film.

The film is called "The Price of Eggs" and was produced by Worcester Film Corp for Jones & Lamson Machine Co. J & L has shown admirable restraint in omitting any selling message for J & L equipment from the film—so much so that the film could be used by any machine-tool builder, or even any capital-equipment maker to demonstrate graphically how the drain of wasted dollars can be stopped. If you want to borrow a print of the film, write to Jones & Lamson Machine Co, Springfield, Vt.

Spline-rolling Changes

THIN-WALLED tubing (as thin as 0.075 in. from the root of the tooth to the ID) can be spline-rolled on Michigan Tool's Roto-Flo machines with new tooling. The change involves round racks with forming teeth all the same size. These racks reciprocate over the part in a short but fast travel and generate the same tooth as produced by hobbing action (if teeth have a 30° or 45° pitch angle). The tube is supported on a mandrel headstock to prevent distortion. The round racks can be notched to roll a spline within ¼ in. of a shoulder.

Foiling the Bull

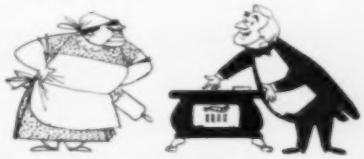
Aluminum companies have always been zealous in promoting new uses for the light metal. Perhaps the end has been reached in word from Alcoa that the Spanish are making swords for bullfighting out of aluminum. This restores to action the old pros whose arms have been so injured that they can no longer lift steel swords.

Knowledge Levels

AT THE RECENT meet of the American Gear Manufacturers Association, Edward Walther reported that there are three levels of knowledge for all of us. We can call these K_1, the things you know; K_2, the things you don't know and know you don't know; and K_3, the things you don't know and don't know you don't know. For example, if you understand linear programming it would fall in K_1. If you've heard of it, but don't understand it, that would be K_2; if you've never heard of it, that is K_3. There is still another class of knowledge, K_n—the things that nobody knows yet. Unfortunately, there is also a K_0—the things you know that aren't so. Mr Walther, of Management Development Associates, was talking about barriers to effective decision making and one of the most important is the failure to recognize and correct the limitations in our knowledge about the decision to be made.

MEMOS

by BESS RITTER



Although it's hard to realize this today, when Millard Fillmore became President of the United States in 1850, the White House had no bathtub with running water and no cooking stove, and the main reason why the new Chief Executive insistently added these innovations was because he was an amateur machinist who "built things" as a hobby.

> **However, the President suffered many a headache in regard to the "cooking machine" he installed in his kitchen. As soon as he did this, the White House cooks, who were used to open fireplaces, quit their jobs, because this "devil's tool" was an insult to their culinary arts. The incident, incidentally, furnishes an excellent example of the fickleness of public opinion: before ten years had passed, a stove was no longer a "devil's tool." Instead owning one was a very real mark of social prestige.**

Today's expression "to have a screw loose," originated, logically enough, with a piece of machinery and those who tended it, and the details of the story are interesting:

> **It seems that cotton was manufactured in the early 1800s by machines which were "manned" with the cheapest labor obtainable, and this included young children and inexperienced adults who knew nothing about the way the power looms operated. Consequently, breakdowns were frequent, but because employees would lose their jobs if they admitted their carelessness and ignorance, they invariably blamed the machines for the resulting defective cloth by saying, "There is a screw loose somewheres in the machine." And inevitably it followed that a person who performed defective work was also excused with the same remark.**

Specially designed lathe . . . hot-coils heavy springs, mostly from AISI 1095. Production is 3600 freight-car truck springs per 8-hr shift. Lathe is set in place on floor; hooked up with quick-disconnect couplings. Springs are wound to pre-determined hot-set height.

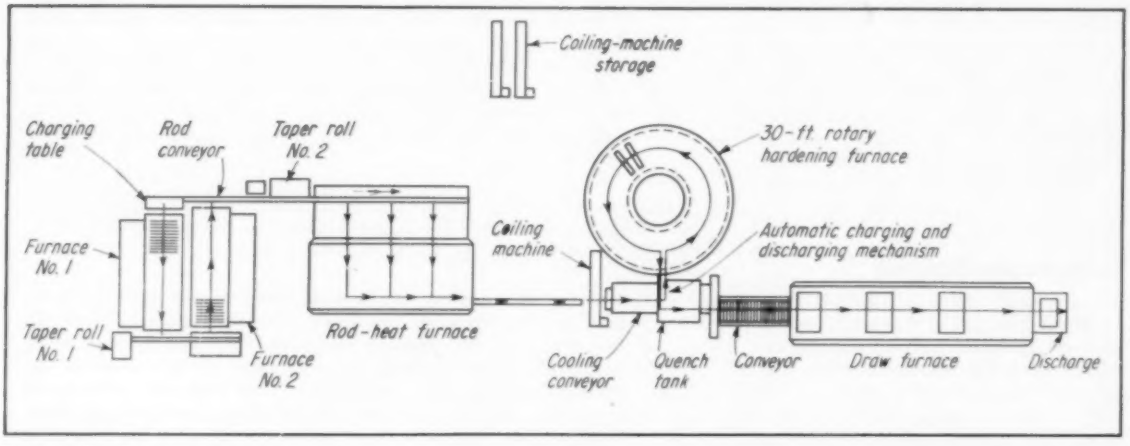
to reduce retooling downtime . . .

Alco Interchanges Pre-Tooled

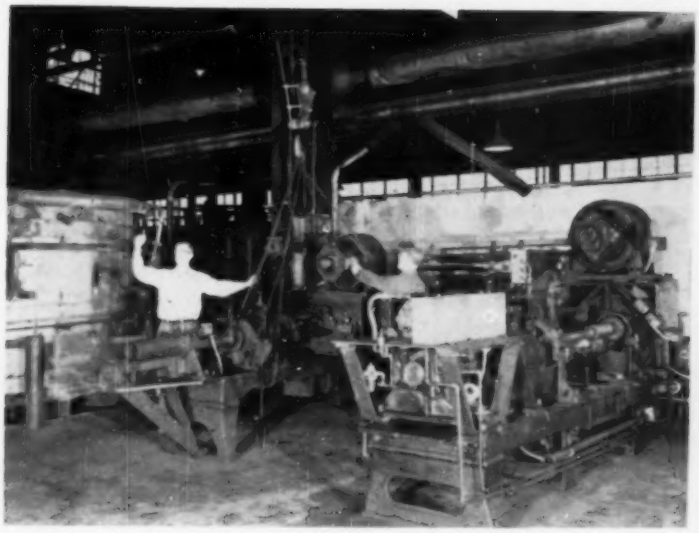
JOHN K GRUSDIS,
manager,
Chicago Heights plant,
ALCO PRODUCTS, INC

Two spare spring-winding lathes are retooled ahead of time, according to schedule, then set in place in a mechanized production line when changeover is made to a different spring size. This limits downtime to a short period while heat-treat and work-handling equipment is adjusted for the new part. Idle lathes are retooled and recycled at leisure in temporary storage area, where regular maintenance is also handled.

Production of 2,000,000 springs/year is therefore interrupted as little as possible. Springs are made from rods with diameters from ½ to more than 2 in. and lengths from 6 to 33 ft, going through heat-treat, coiling, end-tapering, and end-grinding operations. Final applications for the springs are railroad cars (which take 20 or more springs each), locomotives, farm machinery, and heavy tractors.

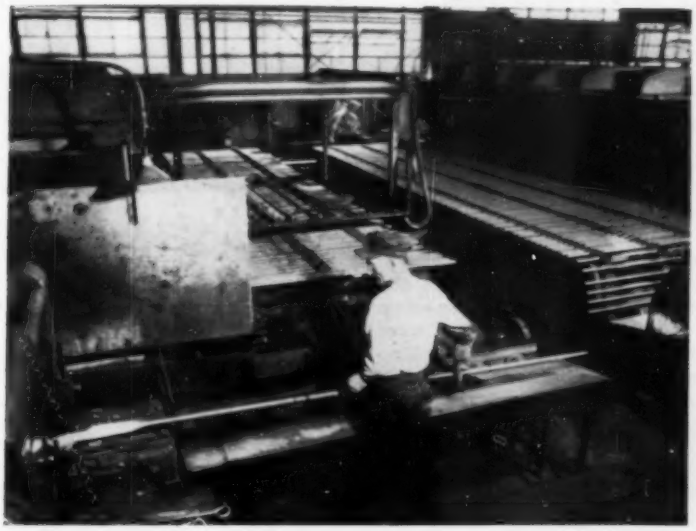


Spring line is mechanized . . . through heat-treating sections. First two furnaces heat rod ends for tapering—so spring will be flat top and bottom. Rod-heat furnaces prepare stock for coiling. Heat-treating after coiling can be set for (1) cooling and reheating for grain refinement, (2) equalization for uniform temperature and quench, or (3) quench direct from cooling. All springs pass through three-stage draw

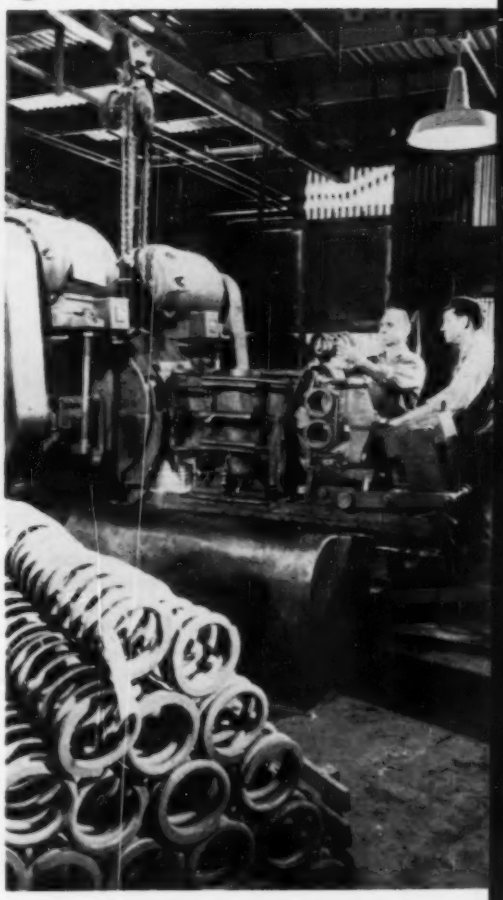


Alternate lathes . . .
are equipped for two other capacity ranges. These are retooled according to production schedule, then carried to production area by bridge crane.

Lathes in Spring-Winding Line



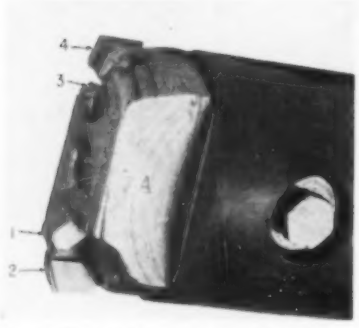
Rod ends are heated . . .
to 1650-1700 F in Electric Furnace Co side-slot equipment with transfer conveyors. Hot ends are then tapered in Ajax forging machines (one in foreground). Next operation heats rods fully for winding.



Duplex Gardner disk grinder . . .
finishes spring ends flat to specified free length. Fixture is double-ended, and pivots about a center pin so two springs can be loaded while another pair is being ground. Final operation is shot-peening at Wheelabrator machine to minimize fatigue failure.

Practical Ideas...

Carbide Wafer Inserts Reduce Reamer Cost



At present the minimum time required to service the reamers necessary to completely ream a 90-mm gun barrel is 9 hours. Of this, 7½ hours are consumed in servicing the holders and cutters.

Most of this excessive maintenance time is spent in machine operations to restore the cutters. In no case will the cutters hold up for more than one pass, and in many cases breakdown occurs before a complete pass is made. The neoprene reamer packs require less atention; usually not before 4 or 5 tubes are completed. Obviously, the cutter-maintenance problem rated investigation.

Shown in the photo at left above is the holding section of a conventional reamer. Wedges 1 and 3 hold the bits 2 and 4 in a precision setting. To maintain this tool setting the wedges must be firmly seated. Note the damage to wedge 3, the result of necessary force to seat the wedge which in turn causes undue strain on the reamer centers. Peripheral grinding from these damaged centers causes an eccentricity of the cutter diameter relative to the pack diameter. In operation, any misalignment tends to produce an oversize bore.

Modification was as follows: A standard meoprene-packed 90 mm reamer body was altered for use in the tests. The cutter-holding section was removed so the pack section could be utilized with a new head designed to receive wafer carbide cutters. To support and position the cutters, hardened steel pockets, bottom plate, and clamp were screwed and dowelled into the head.

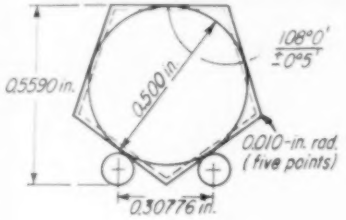
Accurate positioning was necessary so the cutters could be replaced or indexed to renew the cutting edges without grinding the cutter diameter and/or indicating the front face balance. Further modification was made to provide a larger flow of coolant over and parallel with the cutting edges.

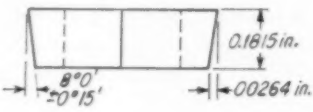
The modified reamer head, shown in the photo at right, is an entirely new design accepting pentagonal carbide wafer inserts. There inserts (see sketch) are indexed as new cutting edges are required. Notations made on the photo of the reamer head are: (A) Pentagonal carbide wafer, (B) HSS chipbreaker, (C) clamp, (D) clamp screw, (E) coolant orifice, (F) location key, and (G) radial helical angle.

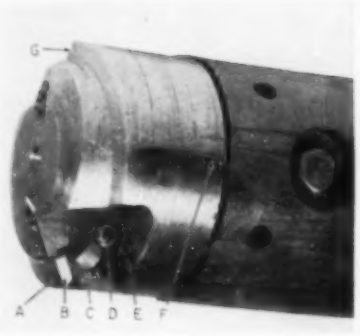
After extensive experimentation on methods of clamping the wafers, a Kennametal style clamp is used to provide pressure on a HSS chipbreaker which in turn clamps flatly against the cutter. Both the cutter and chipbreaker are precisely located in position to: (1) assure accurate location of the cutter upon indexing and (2) to assure a predetermined width of chipbreaker each time the clamp is loosened for maintenance.

With the newly designed head shown in the photo at right, seven tubes were reamed and the results were consistent. To ream these seven tubes, 3 sets of 2 cutters each were used. The chipbreakers suffered no damage and the cutters showed only normal wear.

At a cost of $10.50 per cutter (price of experimental cutters) plus a small maintenance charge, the total reamer cost per tube was $9.93. This







compares favorably with a material cost of $2.00 plus a labor charge of $24.00 for conventional reamers, a saving of approximately $16.00 per reaming.

It is estimated that the initial cost of the new head is higher than the conventional type. However, this cost is offset by fewer reamer bodies required, and they do not have to be removed from the production line for maintenance as is the case with bodies using the conventional head. Because standard reamer dimensions, feeds, and speeds were used, no change in operational time was involved.

P Casey, Project Leader, Watervliet Arsenal, Watervliet, N Y

Old Ball-Point Pen Makes Retractable Scriber

Some mechanics wouldn't feel right without a micrometer and/or a 6-in. scale in their shirt or apron pocket. Others would be lost without a handy pocket knife. With me it's different. I like to have a scriber within easy reach at all times.

It is for this reason that I have converted an old ball-point pen to hold a scriber point. After the ink has been used up I force the ball out and in its place I press a hardened drill-rod point. A pointed bearing needle or an old-style phonograph needle will also make a good scriber.

Now, when I want to scribe a line, I reach for my pen scriber and press the button to eject the point. To retract the point, the button is again pressed.

O H Evans, Phoenix, Arizona

Multi-Cavity Molds Produced In Lathe

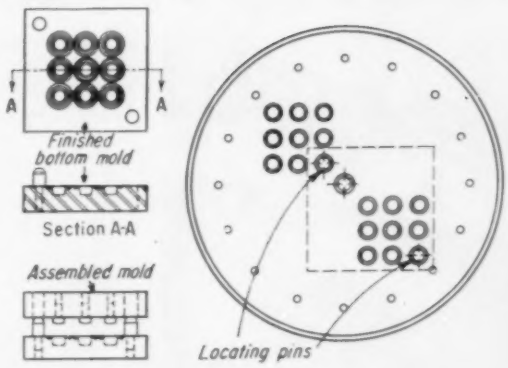
Because of repeat demands for standardized multi-cavity molds, a method had to be devised which positive locations could be maintained without jig boring.

We accomplish this with a special lathe faceplate. Two sets of pilot holes are jig bored in relative positions (nine on each side of the center) to give the location on each individual cavity.

These holes are then fitted with drill bushings. Placed in a circle near the edge of the faceplate are 16 tapped holes for mounting counterweights. A small jig is also necessary for drilling and reaming locating holes in the mold blanks.

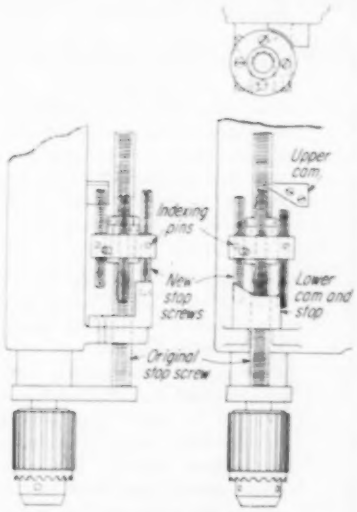
With the tools thus completed, a pilot-drilled blank is mounted on the faceplate, as indicated by the broken lines in the sketch. The blanks are secured with hardened and ground shoulder screws, using nuts on the back of the plate. Proper length stripper bolts should serve this purpose well.

The blanks are machined as required; the top half to receive inserts, and the bottom half with cavities and grooves. (See assembled mold.) When all stations have been machined, (from 1-1A to 9-9A) the



locating holes in the top half are enlarged to suit the diameter of the guide pins. Guide pins are then pressed into the bottom half, and the mold is ready for assembly.

F C Aston, Woolton, Liverpool, England



Multi-Position Drillpress Stops Index Automatically

Much of our work in the drillpress department is on a production basis. Many parts call for the same diameter holes but to different depths. To avoid using loose spacers inserted between contact points of a single conventional stop, or a multi-spindle drillpress, we have made the multi-position stop shown in the sketch for use on our regular drillpress.

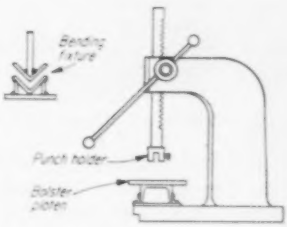
Mounted on the regular stop screw, the unit consists of disk which rotates freely (but not sloppily) on a shoulder sleeve, an internally threaded sleeve which is entered on the stop screw and is locked at any height with a locking collar, and four stop screws threaded through the rotating disk.

The stop screws are locked with setscrews on brass plugs, but if space permits, jam nuts should be used. A small cam is attached above the unit on the drillpress column, and a combination cam and stop is secured to the yoke supporting the main screw. Four short dowels are inserted in the preiphery of the disk for indexing. As the drawing shows, one of the four stop screws rests on the stop surface. The drill is now at the end of its travel for a particular hole. As the spindle raises a pin strikes the upper cam an drotates the disk 45°. When the spindle is lowered the yoke cam engages the next stop screw and rotates the disk another 45° until the stop screw strikes the stop surface. The drill can be partially raised to clear chips without indexing the disk.

H Koslow, Bronx, N Y

Arbor Press Does Small Press Jobs

Experimental-shop craftsmen who are often faced with unusual situations have to be able to make use of



whatever facilities are available to them in performing their work. It is for this reason that our arbor presses see a lot of use other than that for which they were originally intended.

Small jobs of bending, punching, shearing, and nibbling are done with ease in dies and fixtures fitted to the press. We have even done larger braking jobs by linking two presses together.

The sketch shows how a press is equipped with a platen onto which dies are secured. A weldment of a substantially heavy steel plate, supported by a length of channel iron, makes a good mounting for dies. A head made by milling a slot in a square block of steel is bolted to the contact face of the ram. Punches are made to fit the slot, and are clamped in place with a setscrew.

One of the simplest yet most useful dies is also shown in the sketch. It is an angle-iron weldment we use for bending sheet metal to 90° angles.

R C Gordon, Bangalore, South India

Practical Ideas...

Buffing-Grinding Stand Is Quick-Change Utility Tool

Because we do a lot of intermittent buffing, grinding, and sanding in our shop, I wanted to save myself the drudgery of constantly changing wheels on our conventional grinder. The photos show how a special grinding stand has made this job as simple as changing tapered-shank drills in a drillpress.

Each grinding, buffing, and wire wheel we are likely to use is individually mounted on tapered-shank arbors. The spindle of the stand is machined from both ends with tapers to match the arbors. We chose No. 2 Morse tapers, but heavier applications will demand heavier construction.

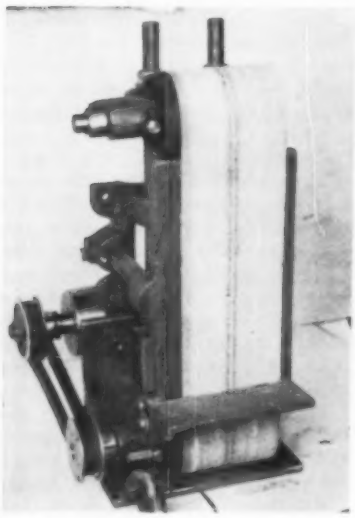
Bores are made deep enough so that when an arbor is driven home it will unseat the arbor already occupying the opposite end. At other times a brass rod is used to knock out the arbors. A drift-key slot has not been incorporated because it has not been necessary.

The stand casing itself is made from a large cast-iron pipe T fitted to a flanged base. This unit can also be made up as a pipe weldment if a T is not available. The horizontal ends are bored to receive seated ball bearings and are externally threaded for retainer caps.

The spindle is machined as one part with a V-groove pulley centered between the two ends. Both ends are turned to a slip fit in the bearings. A fractional-hp motor, equipped with a three-step pulley and mounted under the work bench, provides the power.

Photo top left shows the setup with a few of the arbor-mounted wheels we use. An adjustable tool rest for grinding can be seen at right. In lower photo, a belt sander is powered by the unit through a V-pulley mounted in the spindle.

D R Doremus, E. Rutherford, N J



Plaster of Paris Supports Parts for Heat-Treating

When heat-treating parts like bellows, diaphragms, and springs made from berrylium copper, it is usually difficult to hold them to a minimum of distortion. For small-quantity production such as prototype work, where the expense of fixtures is not warranted, plaster of paris can be used to support the work during heat-treating.

This material is poured around the part to be treated, and the entire mass is exposed to the treatment after the plaster has dried and hardened. After the heat-treating operation, the plaster is broken away from the parts. Obviously, care must be taken when parts and plaster are separated.

If the parts are so delicate that breaking the plaster away might damage them, satisfactory support may be provided by imbedding the parts in fine molding sand.

William De Groat, Altadena, Calif

PAUL KOLB
Chicago, Ill

won $25 in addition to regular payment for his idea:

RADIUS DRESSING

MADE EASY

in the April 21, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

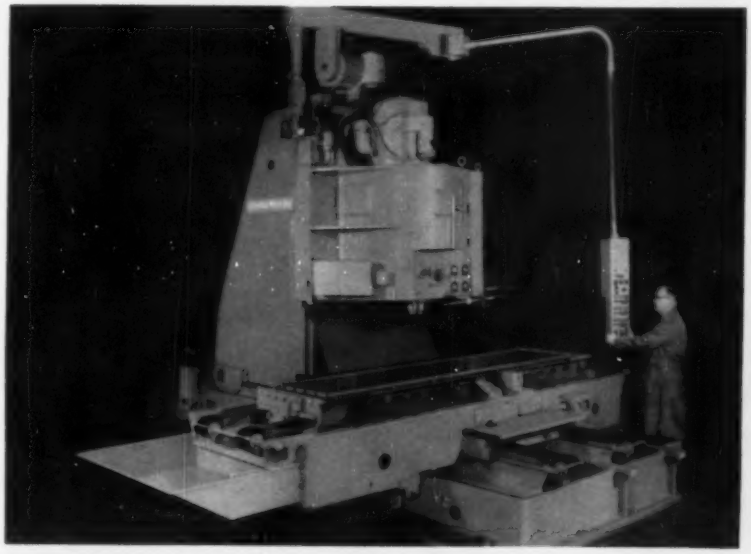
REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

New Shop Equipment

Materials and Parts



Sundstrand Vertical Miller Takes Heavy Cuts on Large Workpieces

New OM5 vertical Rigidmil has longitudinal, transverse and vertical feed. Machine has a 50-hp vertical head mounted on a fixed column for maximum rigidity under heavy cuts. The saddle and table are also carried on a fixed base.

The vertical spindle has a speed range of 14 to 1540 rpm with speeds selected from the control pendant. Vertical travel (head) is infinitely adjustable within a feed range of 3/16 to 50 ipm in either direction. Rapid traverse rate is 50 ipm. Distance from table to face of spindle nose is 6 in. minimum, 30 in. max.

Transverse travel (saddle) is infinitely adjustable from ⅜ to 75 ipm in either direction. Rapid traverse rate is 75 ipm. Distance from centerline of spindle head to face of the column is 16 in. minimum, 60 in. max.

Longitudinal travel (table) is infinitely adjustable from ⅜ to 150 ipm in either direction. Rapid traverse rate is 150 ipm. Table is 30 in. wide, 132 in. long, and has a maximum travel of 96 in.

Vertical, transverse and longitudinal feed movements, feed rates and rapid traverse are all controlled from the pendant. Table movements can also be controlled from preset dogs for automatic cycles, if desired. All feed rates are indicated on meters at the pendant.

Machine can be provided with a power draw-rod, operated from pendant, for facilitating cutter removal. Other optional features include way guards for keeping horizontal, vertical and transverse ways free from falling chips.

Sundstrand Machine Tool Co, Rockford, Ill

Heat-Resistant Ceramic Withstands Extreme Thermal Changes

Pressed ceramic parts able to withstand extreme thermal changes, such as water quenching from 2200 F, are now available in production lots fabricated in a new material known as ThermoShock HT-2. The material's zero thermal expansion over a 2400-F range is reported to be the key to its thermal shock resistance.

Applications include use as welding jigs, brazing jigs and sintering fixtures. Material can also be used in high temperature components such as thermocouple insulators, electrical appliance insulators, missile and aircraft heat barrier parts, furnace parts and welding nozzles.

Present size limits allow volume production of parts to 2-in.-max OD x 2-in.-max length. As fired tolerances can be as close as ±0.005 in., and the fired parts can be ground to tolerances of ±0.0001 in.

Duramic Products, Inc, 262-72 Mott St, New York 12, NY

Gulton Develops Hand-Operated, Ultrasonic Aluminum Foil Welder

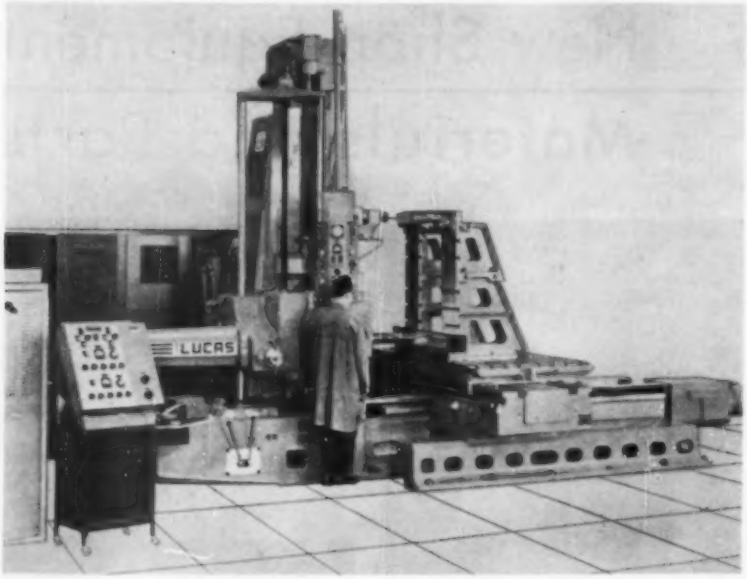
The ultrasonic aluminum foil welder is designed as a hand unit and is powered by a 100-w ultrasonic generator. Using no heat, flame, solder or flux, the welder has been tested successfully on aluminum foil down to 0.0003 in.

Simple to use, the unit produces sealed joints which would make it possible to seal products airtight in aluminum envelopes. It operates at 20,000 cycles, and is the outgrowth of a previous continuous seam, ultrasonic aluminum welder (*AM*—Mar 10 '58, p166).

High frequency sound waves accomplish a molecular transference or plastic flow between the two metals and the result is a weld stronger than either of the pieces joined.

One of the greatest potentials, it is pointed out, of the foil welder indicates the use of aluminum for electrical connections. Despite its excellent electrical conductivity, aluminum has been sparingly used in these applications because it was too difficult to join to other metals.

Gulton Industries, Inc, 212 Durham Ave, Metuchen, NJ



Lucas Introduces Program-Controlled Boring, Drilling, Milling Machines

A complete line of table-type and floor-type horizontal boring, drilling and milling machines is now available with General Electric program controls. The machines can be furnished with tracer equipment, numerical positioning equipment (punched tape) or numerical contouring equipment (magnetic tape).

A unique feature of this line of machines is the ability to operate either as fully automatic, program-controlled machines or as standard boring, drilling and milling machines. Rapid changeover results in flexible automation which can be used for a wide variety of special work as well as standard work.

Tracer-controlled machines have either one-dimensional, two-dimensional, selective 2-D or 3-D tracer equipment. Numerical position control can be furnished for as many as six motions—head, table, saddle, horizontal rotary table, vertical rotary table and spindle feed. Data input is accomplished through manually set decade switches or punched tape. Machines equipped with both tracing and positioning systems can contour fully automatically.

Machines equipped for numerical contouring (magnetic tape) have continuous control of one or all of the above motions simultaneously while milling complex contoured parts.

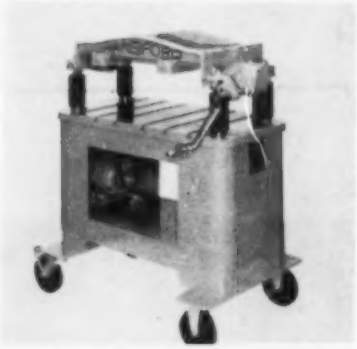
New Britain Machine Co, Lucas Machine Div, 12302 Kirby Ave, Cleveland 8, Ohio

Adjustable Multi-Spindle Head Accommodates up to Ten Spindles

This multi-spindle head accommodates from two to ten spindles in sizes of 7, 10½, 12½ and 15½ in. Bolt circles up to 23 in. diameter allow almost any pattern to be drilled or tapped within a given circle.

Spindles are driven by a crank-type drive shaft. The shaft of each spindle is driven by the standard Zagar gearless drive. Spindle arms can be changed rapidly. Head, which can be used on any standard drill-press, requires no auxiliary equipment.

Zagar, Inc, 23886 Lakeland Blvd, Cleveland 23, Ohio



Open Top Platen of Die Handler Gives Access to Top of Die

Model 1018 die handler is a small size unit featuring all-cast construction, providing rigidity and accuracy. The open top platen gives access to the top of a die and any screws entering from the top. The four-lead screw construction with thrust bearings allows off-center pull such as needed in separating two-post dies or off-center "tryout forces" up to 1000 lb.

Hansford Mfg Corp, 1239 University Ave, Rochester 7, NY

Bench Shaper is Equipped With Automatic Pressure Lube System

Improved 7-in.-stroke bench shaper is equipped with an automatic pressure lubrication system to provide smooth operation at high speeds. Oil pressure is adjustable and can be maintained at all speeds.

Stroke is adjustable from zero to 7 in. Stroke rates range from 42 to 195 spm and cutting speeds from 3 to 114 fpm. Tool head has 3-in. feed and swivels to any angle. Worktable is 6 5/16 in. long, 5 in. wide and 5⅜ in. deep. Power cross feeds range from 0.002 to 0.012 in. with a maximum travel of 9½ in. Vise has graduated swivel and swivels to any angle; jaws are 4 in. wide, 1 in. deep, with a max opening of 4 in.

South Bend Lathe Works, South Bend 22, Ind

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MACHINES AND ATTACHMENTS

1 PLAIN HYDRAULIC CYLINDRICAL GRINDERS—*Landis Tool Co, Waynesboro, Penna.* 20-page catalog B-571 gives information on 10-in. CH and 14-in. LCH units. Features and work setups illustrated and described, specifications included.

2 4-COLUMN HYDRAULIC PRESSES—*Oliver Corp, A B Farquhar Div, Press Dept, 188 N Duke St, York, Penna.* 4-page illustrated bulletin H-5000 covers design features, contains data on types of controls, pumps, and cushions available. Specifications on standard sizes detailed.

3 VERTICAL 4-SLIDE MACHINE — *A H Nilson Machine Co, Shelton, Conn.* Illustrated catalog V-187 contains specifications table on the Vertiform for wire and metal forming. Design features, standard and optional equipment covered.

4 DRILLING-LAYOUT MACHINE — *Wales Strippit Co, 500 S Buell Rd, Akron, NY.* 4-page illustrated catalog gives specifications on Model 25-A Flex-O-Drill table model unit that eliminates necessity for a base line drawing and vernier height gage layout. Machine also reams, scribes, and center-punches, and is said to be suitable for pilot runs and low unit production to its capacity of 24 x 24 x ¼-in. mild steel.

5 ROTARY SWAGING MACHINE — *Torrington Co, Swaging Machine Div, Torrington, Conn.* Brochure describes new electro-hydraulic die closing machine designed to make reductions in diameter on rods, heavy tubes, or other parts which cannot be reduced by feeding into the standard model. Specification sheet covers installation, operating, and adjusting information.

6 WALL CHART ON COLD CUTTING—*Ernest F Donley's Sons, Inc, 10303 Miles Ave, Cleveland 5, Ohio.* Insto Service Chart, 20½ x 14½ in. provides answers to common problems in cold cutting of metal.

7 HYDRAULIC PRESSES—*American Steel Foundries, Elmes Engineering Div, 1150 Tennessee Ave, Cincinnati 29, Ohio.* 24-page bulletin 1010-C illustrates and describes line with electric control that provides semi-automatic operation, automatic, and inching. Standard designs and examples of special custom-built units are covered.

8 SWISS PRECISION MACHINERY —*Carl Hirschmann Co, Manhasset, NY.* 8-page catalog contains illustrated descriptions of the new Dubied 514 and 515 copying lathes and the Kummer semi-automatic lathes, toolmakers' lathes, automatics for tough alloys, pivot burnishers, twist drill and carbide tool grinders, jig borers and high power optical projectors and comparators.

9 POWER PRESS EQUIPMENT — *Cooper Weymouth, Inc, 600 Honeyspot Rd, Stratford, Conn.* Catalog 58 contains specifications and description of features of line of reeling, straightening, feeding, and scrap handling equipment for presses, shears, etc.

10 TUBE CUTTER—*Steel Products Engineering Co, Div of Kelsey-Hayes Co, Springfield, Ohio.* 6-page illustrated brochure presents details on the Brehm automatic unit for cutting tube up to 20 ft long, ⅜ to 2⅛ in. diameters.

TOOLS AND ACCESSORIES

11 CUTTING TOOLS—*Vascoloy-Ramet Corp, Waukegan, Ill.* 88-page plastic-bound catalog indexes and covers complete line of products. Grade chart explains the 14 grades of cemented carbide now available from V-R; physical properties, recommended cutting speeds listed. Illustrated sections cover carbide blanks, tools, carbide and ceramic inserts, toolholders, face mill cutters, tantung tools, and tantung technical data; surface speed and tool selector chart included.

Fill in number of each bulletin wanted

Name _____

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Company _____

Business Address _____

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FYI
FOR YOUR INFORMATION

12 DRAWING COMPOUNDS — *Reilly-Whiteman-Walton Co, Conshohocken, Penna.* Technical bulletin describes complete line for severe cold working of metal; combines a complex phosphate coating and lubricant in a single application.

13 X-RAY ANALYSIS THEORY & INSTRUMENTATION — *Philips Electronics, Inc, Instruments Div, 750 S Fulton Ave, Mount Vernon, NY.* 12-page booklet covers principles of operation; diagrams illustrate basic differences between film diffraction, diffractometry, and spectrography; three methods treated in detail.

14 THERMOCOUPLE ASSEMBLIES — *Thermo Electric Co, Saddle Brook, NJ.* 12-page illustrated catalog (Section E) on heavy-duty industrial assemblies describes each component. Six basic types of standard wire-type and Ceramo thermocouples in all standard gages and calibrations described. Assemblies cover temps from −300 to +2200 F.

15 LUBRICATION—*Bijur Lubricating Corp, Rochelle Park, NJ.* Bulletin NB-20 presents illustrated case histories of variety of machines using Spraymist coolant equipment or different types of lubricators. Specific bulletins available on each type are listed.

16 COOLANT BACTERICIDE—*Cincinnati Milling Products Div, Cincinnati Milling Machine Co, Cincinnati 9, Ohio.* 4-page brochure PC-352 describes Cimcool "00" Wafers for treatment and protection against rancid cutting fluids. Features and directions for use covered.

HEAT TREATING AND WELDING

17 FURNACES—*Lindberg Engineering Co, 2444 W Hubbard St, Chicago 12, Ill.* 22-page bulletin 242 illustrates and describes hardening, carbonitriding, and carburizing units, batch and continuous types.

18 WELDING EQUIPMENT — *Hobart Brothers Co, Hobart Square, Troy, Ohio.* Illustrated folder DM-73 gives details on all types of automatic and semi-automatic equipment; covers power sources, wire feed mechanisms, guns, heads, and controls for submerged arc and inert-gas-shielded arc welding.

19 ARC WELDING OF TITANIUM — *Mallory-Sharon Metals Corp, Niles, Ohio.* 8-page technical brochure discusses method and techniques. Lists various commercially pure grades and titanium alloys which can be arc welded; basic problems in handling discussed; table shows max bends available.

20 CHILLING EQUIPMENT AND TEST CHAMBERS—*Cincinnati Sub-Zero Products, Reading Road at Paddock, Cincinnati 29, Ohio.* 12-page catalog presents illustrated descriptions of 13 models of chilling machines and 11 models of industrial temperature testing units. Specifications furnished for each. Contains graphs of technical data regarding metal treatment, including charts of typical cycles in heat treatment and sub-zero treatment of water and oil hardening tool steels and other steels.

PARTS AND MATERIALS

● FILTERS — *Bendix Aviation Corp, Filter Div, 424 W 12 Mile Rd, Madison Heights, Mich.* 132-page illustrated engineering and application reference manual deals with filters for aircraft, missiles, and many industrial applications. Contains subject, quick-reference, and numerical parts indexes; discussion of particle sizes and basic filter media. Engineering specifications including components and parts numbers, flow curves, capacities and sizes given for 30 different types. Request direct on company letterhead.

● MACHINING OF COBALT SUPERALLOYS—*Cobalt Information Center, c/o Battelle Memorial Institute, 505 King Ave, Columbus 1, Ohio.* Special report gives machining data and operating instructions for 22 superalloys and 3 metal-glass sealing alloys. Tables provide information on tool material and geometry, tool material guides, machinability index and hp required at cutting point, conversion of sfm to rpm. Request direct on company letterhead.

21 AUTOMATIC TRANSFER SWITCHES—*Automatic Switch Co, Florham Park, NJ.* 24-page illustrated booklet 596R1 contains selection and application data. Discusses inrush capacity, continuous duty rating, rapid transferral of load, structural and operational features.

22 STAINLESS STEELS — *Jones & Laughlin Steel Corp, Stainless Steel Div, Box 4606, Detroit 34, Mich.* Series of data sheets on 17 types covers chemical composition; applications; processing; physical and mechanical properties; machining, forming, and welding. Accompanying 8-page guide indicates corrosion-resistance to various chemical media.

23 FLEXIBLE GEAR COUPLINGS — *Sier-Bath Gear & Pump Co, 9238 Hudson Blvd, North Bergen, NJ.* 20-page reference manual C-5 illustrates and describes entire range of standard types and sizes, plus data on special types. Includes installation information; applications; lubrication requirements; engineering data.

24 WIRE ROPE ASSEMBLIES—*Macwhyte Co, Kenosha, Wis.* 23-page catalog 5601 contains detailed information on Safe-Lock standard assemblies available for ordering as a stock item. Specifications included as well as decimal equivalents table.

25 MAGNETIC CLUTCHES AND BRAKES—*Fawick Corp, Airflex Div, 9919 Clinton Rd, Cleveland 11, Ohio.* 8-page illustrated bulletin M-101-A describing electrically operated units available in 13 standard sizes with diameters from 2 to 13 in. and torque ratings from 27 to 66,000 in.-lbs includes dimensions, torque ratings, power requirements, suggested control circuits.

● METAL STAMPINGS—*Pressed Metal Institute, 3673 Lee Rd, Cleveland 20, Ohio.* 1958 Blue Book of Metal Stamping Manufacturers lists suitable sources for metal stampings. Stamping buyers may obtain by requesting direct on company letterhead.

Fill in number of each bulletin wanted

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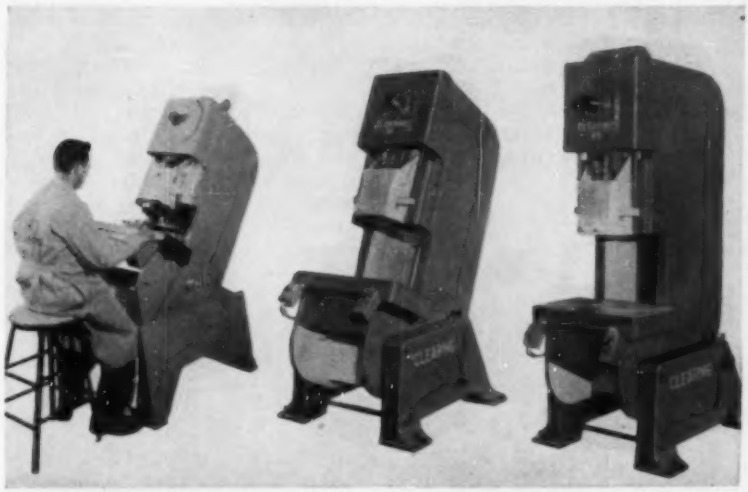


Presses Offer Integral Drive Units And New Clutch and Brake Design

Clearing Torc-Pac OBI's, the latest additions to company's line of open back inclinable presses, are available in capacities of 22, 32 and 45 tons. They are reported to embody many new design features of interest to the metalworking industry.

An air-friction clutch and brake is standard equipment. The clutch and brake plates are of long-wearing sintered bronze, and operate in an oil bath at all times. Upon engagement, oil is momentarily trapped between the plates. Oil molecules are compressed to a point where the oil itself begins to transmit the pick-up load. Much of the pick-up is accomplished before a metal-to-metal contact is made, thus reducing the wear on the plates.

The Torc-Pac press has an integral drive unit which consists of all working members of the drive and slide—the main motor, belts, flywheel, clutch and brake, double reduction gearing, eccentric shaft, pitman, slide and gibs. The drive can be removed as a single unit. Only six bolts need be removed to dismount the drive from the press. This offers a great deal of convenience and accessibility for maintenance.

Other features include all welded steel frame and heavy construction throughout. Operating controls including four-position selector switch and run and stop buttons are standard equipment. Prices start at $1395 for a ready-to-run 22-ton press.

Clearing Machine Corp, Div of U S Industries, Inc, 6499 W 65 St, Chicago 38, Ill

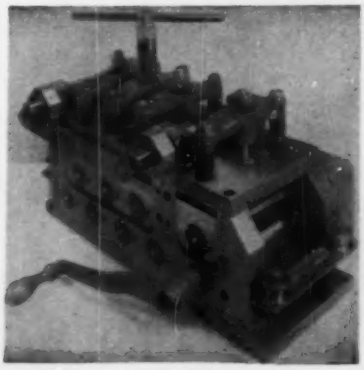
Lapping Machine Gives Flatness To Less Than One Light Band

This 24-in. semi-automatic lapping machine can deliver flatness to less than one light band (0.00011 in.) and a surface finish as low as 1 mu-in. rms. It offers a fully automatic work cycle, a variable speed drive for selecting best lapping rate, and specially designed magnetic truing rings which maintain continuous plate flatness while machine is operating.

Designed primarily for lapping small parts in production lots, machine can also accommodate any large casting or similar part that will fit in any one of the truing rings, which have an 8⅞ in. OD.

Lapping table speed is infinitely adjustable from 16 to 76 rpm. Lapping compound is automatically supplied from a special tank which has a built-in agitator. Bulletin MT-002.

Taft-Peirce Mfg Co, Woonsocket, RI



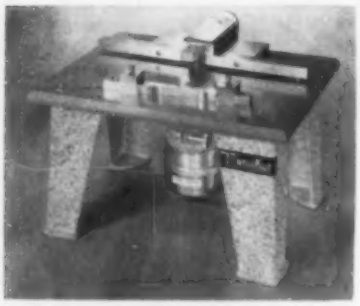
Durant Stock Straightener Incorporates New Features

Heavy-duty model takes light or heavy stock up to ¼ in. thick and 4 in. wide and may be adapted to special widths up to 10 in.

New design permits entering and starting of new stock coils through the straightening run without necessity of resetting the rolls or losing the original required stock thickness setting. A ½ turn of the control crank releases the top three straightening rolls simultaneously while the four bottom rolls maintain alignment. After the stock is entered into the unit it is possible to reset the same straightening pressure by a ½ downturn of the crank. Unit also has two entrance rollers independent of the straightening rolls which are crank controlled.

Durant Tool Co, Providence, RI

TAPPING MACHINE, Model 25-20, adaptable for both vertical and horizontal operation, has a ¾-in. capacity—10 NC tap in mild steel, and reversing motor-type head with 2½-in. leadscrew stroke. Speeds are available from 190 to 1200 rpm—*Kaufman Mfg Co, Manitowoc, Wis*



Increased Horsepower Speeds Machining of Tensile Specimens

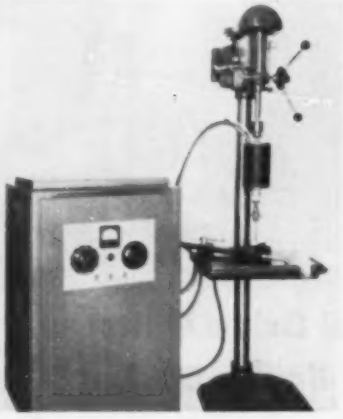
Machine called Tensilkut is designed for precision machining of tensile, fatigue and other physical test specimens.

The increased horsepower of this latest model provides greater capacity with reduced machining time. Test specimens from light 0.00025-in. foil or heavy 0.500-in. plate can be precision machined from a wide range of metals including aluminum, stainless steel, copper, titanium, uranium, lead and superalloys.

Machining consists of a series of light cuts with a carbide cutting tool rotating at a speed of 20,000 rpm. These light cuts do not change the physical properties of the specimen, as is often the case with conventional milling techniques, where the cutting pressures and the heat generated tend to alter the properties of the specimen.

The time required to machine a specimen depends upon the type and gage of the metal being used. A single aluminum sample 0.040 in. thick requires 20 sec while a titanium sample of the same gage requires 60 sec. Tolerances are within 0.0005 in. The machine is available in both floor and table models.

Sieburg Industries, Inc, Horse Plain Rd, New Britain, Conn



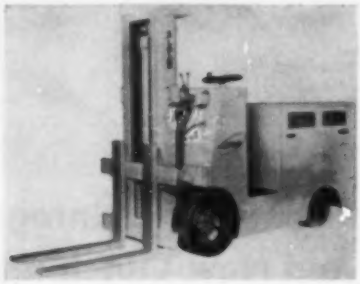
Metal Disintegrating Unit Cuts Very Hard Metals

Model C-66 electric arc metal disintegrator has its own pumping system and is used in conjunction with other shop equipment such as drill-presses. Its best application is in the removing of broken taps, reamers, studs, pins, etc.

Cutting is accomplished by creating a series of intermittent electric arcs which disintegrate the hardest of metals. Cutter tool is an electrode held in the disintegrating head. Coolant is pumped through the electrode to wash away the particles of metal as they are removed.

Machine also provides an economical means of drilling curved and other shaped holes in very hard metals such as hardened steels, carbide, titanium, and Stellite. It cuts slots, oil holes, pilot holes, end mills and keyways. Literature available.

Cammann Mfg Co, Inc, 2700 Henninger Rd, Cleveland 9, Ohio

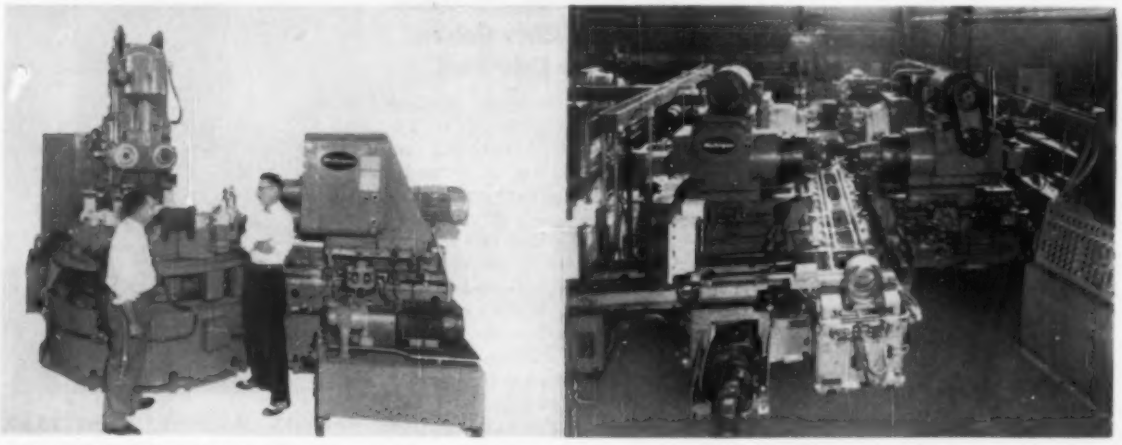


Stand-Up, Center-Control Trucks Available in Five-Model Line

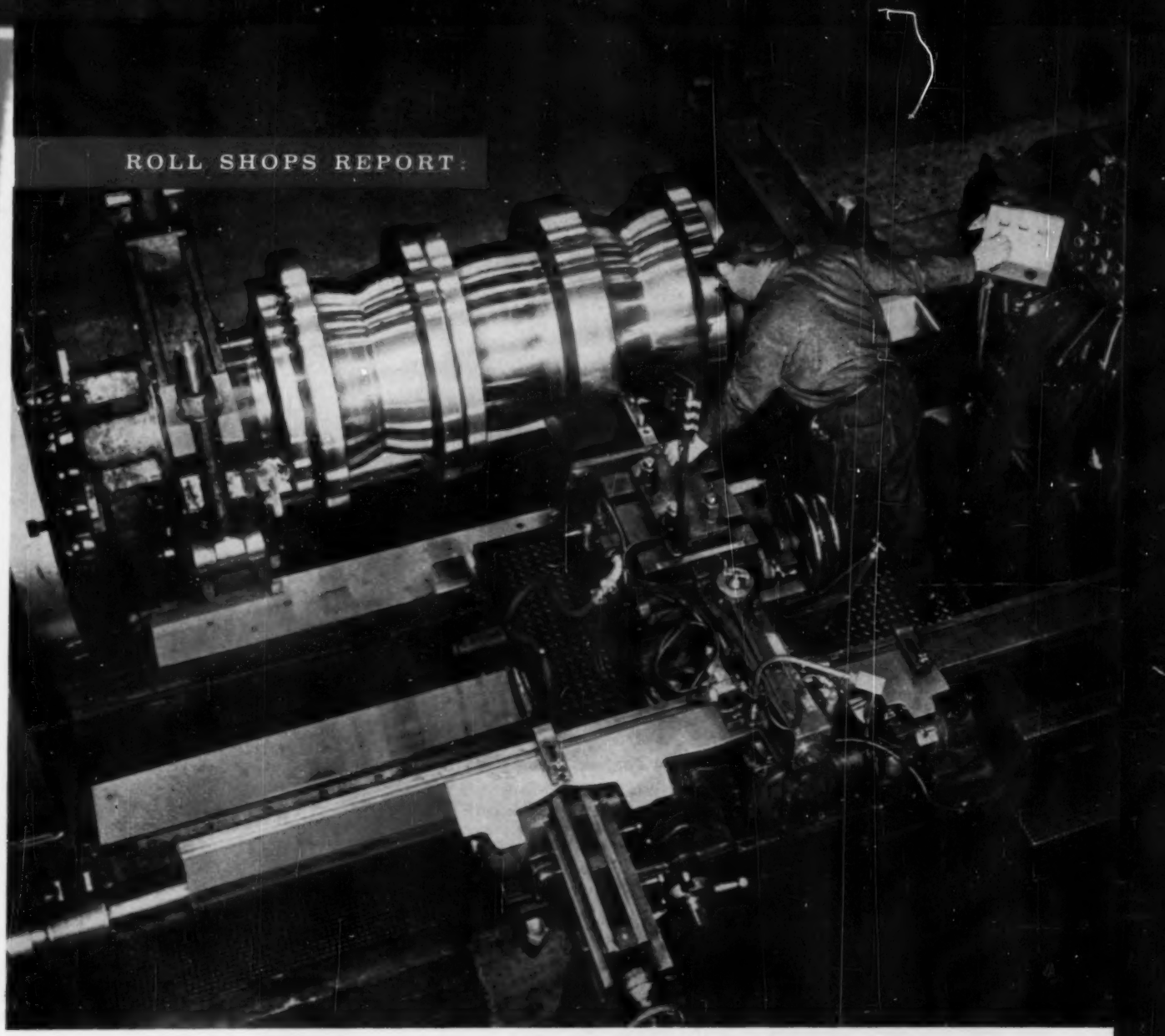
Line of electric-powered fork trucks is available with capacities of 4000, 6000, 7000, 8000, and 10,000 lbs. All models feature front-wheel drive and rear-wheel steer for maximum maneuverability.

Features include contactor control with automatic acceleration; four speeds forward and reverse with direction and acceleration through a single hand control lever.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio



GEAR REDUCING HOUSINGS are machined on the Septuple Production Giant (also known as the Michigan Giant 7). Unit produces, from rough castings to finished parts, seven different sizes of housings, ranging in weight from 85 to 800 lb. Bores are rough and finished machined; screw holes drilled and tapped; dowel holes drilled; breather, oil level and drain holes are drilled and pipe tapped; and flanges are rough and finish faced. Machine consists of a 3-station dial-type machine (left) and an 11-station transfer machine (right). Storage racks and tool boards are provided for the pre-set tooling—*Michigan Drill Head Co, PO Box 4643, Detroit 34, Mich*



"The skill's built in...and it does the work of three!"

What are your most urgent roll problems? A growing work load...high roll turning costs . . . a shrinking supply of skilled roll turners? *If that's the case, you're no different from 90 per cent of steel mill roll shops.*

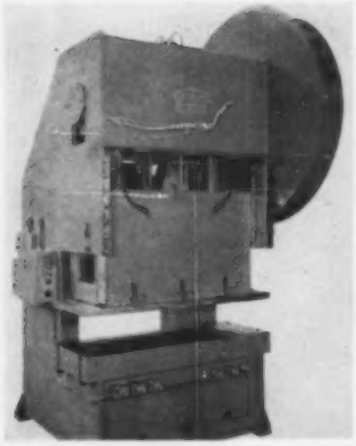
Mack-Hemp Automatic Contouring lathes solve these problems for you. They reduce turning time by taking off more metal in one hour than a roll turner can in three or four on a block lathe. Yet Mack-Hemp lathes accurately reproduce within 0.001-inch complicated roll patterns from ful-size templates by means of an electronic "pilot."

That's why many leading steel mill roll shops are using Mack-Hemp contouring lathes and why a number of others have ordered them.

To find out how these lathes can help you, drop us a line today.

MACKINTOSH-HEMPHILL
Division of E. W. BLISS Company
Pittsburgh and Midland, Pa.

MACKINTOSH-HEMPHILL DIVISION PITTSBURGH, U.S.A.
BLISS

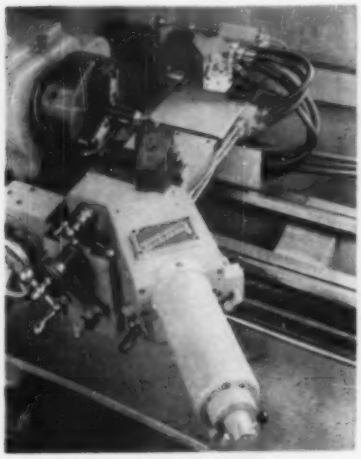


Double Crank Open Back Gap Press Features Drum Friction Clutch

Designed for automatic feeds and greater convenience in handling large or irregular sheets, new Cleveland press, of welded steel construction, incorporates an electrically controlled friction clutch.

Slide is provided with power adjustment, is air-counterbalanced, has a stroke of 10 in. and 5 in. adjustment. Shut height is 22 in. Both bed and slide have an area of 28 x 72 in. Unit is single geared. By modifying various dimensions such as stroke, slide adjustment, bed and slide areas, units are available in an almost unlimited range for punching, shearing, perforating, bending, and forming of metal of almost any thickness from light sheet to heavy plate. Complete specifications and operating data are available from manufacturer.

Cleveland Punch & Shear Works Co, 3917 St Clair Ave, Cleveland 14, Ohio

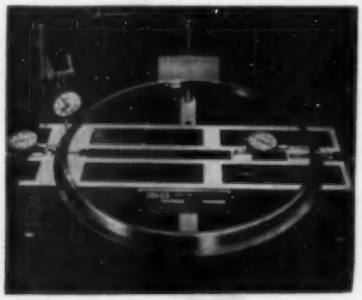


Lathe Tracer Attachment Simplifies Contour Turning

The True-Trace single dimension, 45° lathe tracer attachment permits relatively unskilled labor to perform such tracing applications as step shaft turning, contour turning, and facing operations involving both simple and complex contours.

Flat or round templets can be used. Unit is adaptable to almost all makes of lathes. Complete package consists of a new cross-slide and tool post slide, single dimension hydraulic tracer and power unit, as well as templet rail, attachment brackets, templet centers and flat templet mounting plates. Bulletin available.

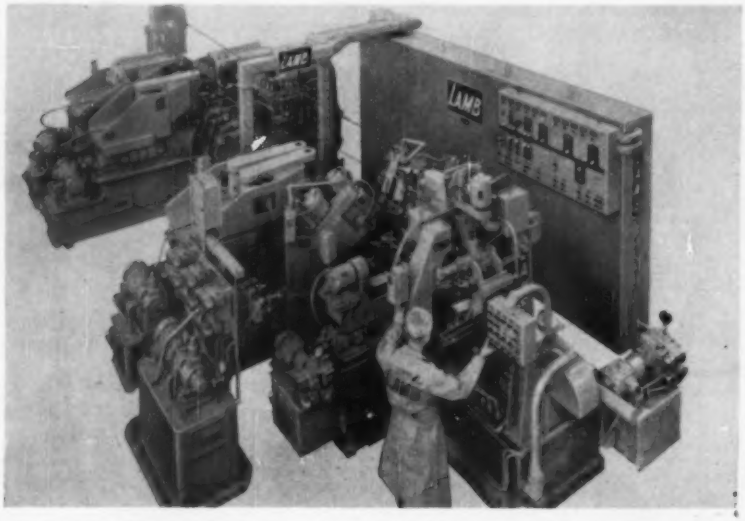
True-Trace Sales Corp, 9830 E Rush St, El Monte 50, Calif



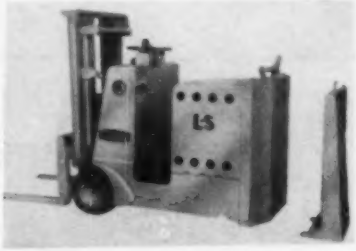
Universal Gage Checks up to Six Dimensions Simultaneously

Universal gage, designated Johan, can be used on parts ranging in size from 1/16 to 20 in., and it measures OD's, ID's, concentricity, out-of-roundness, height and depth. Designed to check as many as six dimensions in one setting, this gage measures as accurately as 0.0001 in. Rapid resetting adds to its versatility.

New Haven Trap Rock Co, Machine Products Div, North Branford, Conn



PISTON TRANSFER MACHINE performs multiple boring, drilling, milling, gaging and marking operations on 450 pistons per hr. Machine is completely automatic. Design provides for complete flexibility when part change occurs. Features include interchangeable fixture parts, concealed coolant piping and conduit within base, integral chip-coolant chutes and numerous safety and control devices— *F Jos Lamb Co, 5663 E Nine Mile Rd, Detroit 34, Mich*

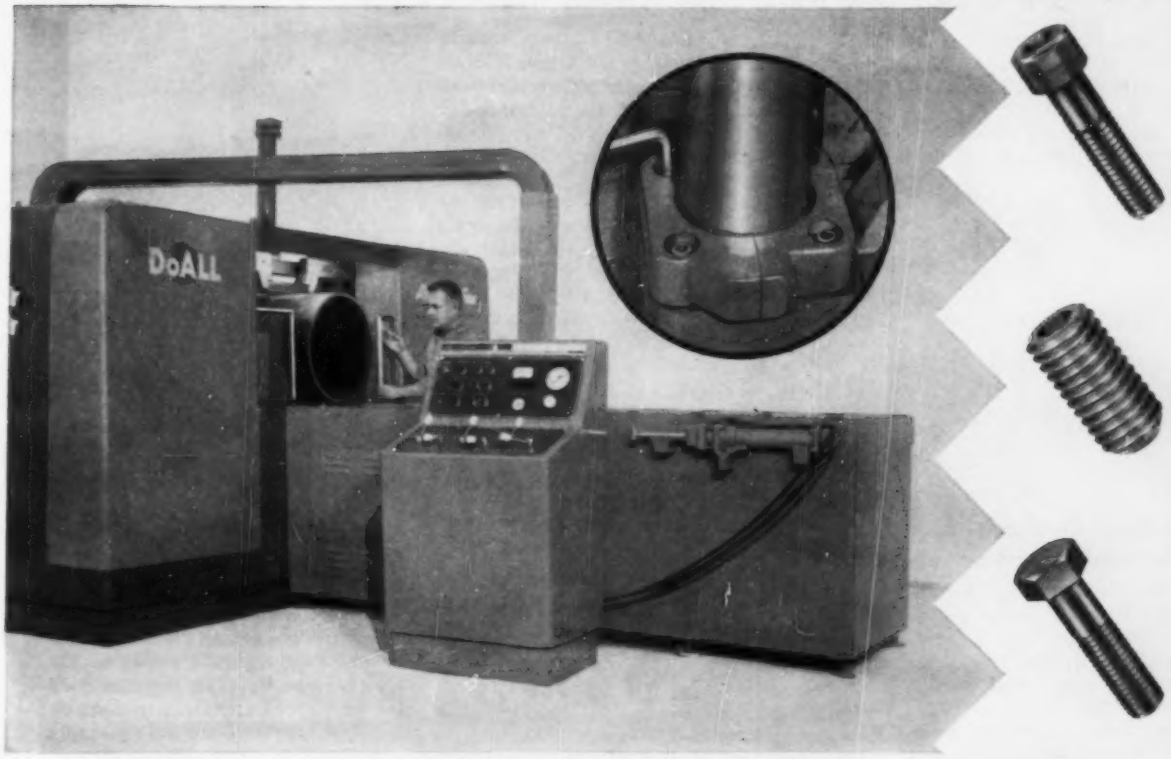


Multi-Master Lift Truck Is Dual-Capacity Unit

Model E electric fork lift truck has standard capacity of 2000 lbs at a 48-in. load length. By adding a quickly removable counterweight to truck's rear, capacity is doubled to 4000 lbs at 48-in. load length.

Stand for the counterweight, included as standard equipment, makes removal or placement only a matter of loosening two bolts. To remove, operator backs his truck against the stand, loosens the bolts,

IT PAYS TO STANDARDIZE ON STANSCREW



Stanscrew fasteners meet DoALL standards for high strength, rigidity, "clean" design

This outstanding machine was developed by the DoALL Company to handle industry's largest, toughest cut-off jobs. Not a beefed-up model of existing machines, this "biggest band saw built" is a unique new design. As one example, the cutting head travels vertically, but cutting takes place on the lower edge of the top saw band.

The new design of this unit, Model C24, therefore represents an entirely new concept of rigidity, applied power, and precision control. These basic considerations dictated the selection and application of every part . . . including, of course, the fasteners.

Small wonder, then, that DoALL's design engineers, after consultation with Stanscrew's fastener specialist, selected Stanscrew socket cap screws for vital applications such as attaching hydraulic cylinders. These reliable fasteners provide the high strength needed. Correctly applied, they give assurance against misalignment even after extensive use—a must in this precision machine. And, by permitting flush, snag-free surfaces, the fasteners also contribute to the C24's superior styling.

Like DoALL, other leaders of American industry are learning the advantages of calling in a Stanscrew specialist when a new product is on the drawing boards. His wide experience can often suggest ways to cut fastener or assembly costs . . . for example, by substituting a standard fastener for a costly special. He can make suggestions from Stanscrew's complete line of over 4,000 types and sizes, always in stock and quickly available.

So whatever your requirements in fasteners, call your Stanscrew distributor today. He will gladly arrange for a prompt visit from the Stanscrew fastener specialist.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

and counterweight automatically drops into the stand and is held in place by a chain. Process is reversed for placement.

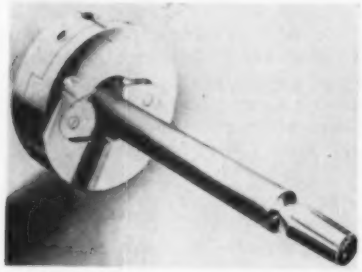
Lewis-Shepard Products, Inc, 185 Walnut St, Watertown, Mass

Surface Roughness Gage Works In Parts as Small as ⅛ in. ID

New Profilometer Group III includes the Type QC Amplimeter, the Type V Mototrace, the Type LK Tracer and the Type BK Linkarm. The tracer, with single-skid skidmount, measures on ID's and OD's as small as ⅛ in. Motorized tracing is provided by the Mototrace. It gives a smooth, steady motion at a speed of 0.3 ips, with quick reversals, over any desired length of trace from 1/16 to 2¾ in. Manual tracing is optional.

The Amplimeter shows arithmetical or rms average roughness height, as selected by switch on panel. There are six ranges: zero to 3, 10, 30, 100, 300 and 1000 mu-in. Roughness width cutoff selection of 0.010, 0.030 and 0.100 in. is also provided.

Micrometrical Mfg Co, 345 S Main St, Ann Arbor, Mich



Work Driver's Serrated Jaws Provide Overlapping Contact

Model, for use on any machine carrying work on centers that require a means of rotation, is designed to eliminate dogging time and to permit an operator to handle two or more machines.

Angular serrations of the jaws provide overlapping contact and positive quick grip on both smooth finish and hot rolled stock, and on forgings having a relatively hard surface. Jaws tighten automatically in relation to depth of cut. Bodies are made in two types: adapter plate with recessed back, and direct mounting type for mounting on American standard type A-2 spindle noses. Automatic driver slides are made in four different styles with several capacities. Jaws are available with either coarse or fine serration. Unit is available in 18 standard sizes with work diameters from ¼ to 6⅞ in.

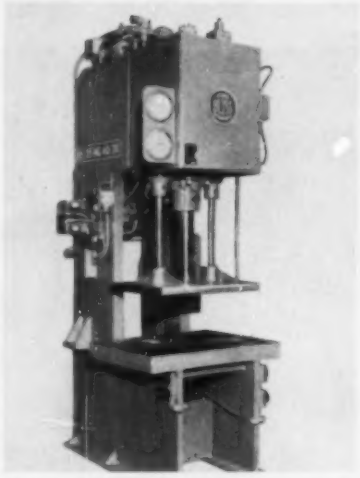
Seneca Falls Machine Co, 11 Fyfe Bldg, Seneca Falls, NY

Layout Machine Marks Five Sides, Inside Surfaces in One Setting

The new PDQ layout machine lays out and scribes work from five sides and on inside surfaces with only one setting of the casting. Workpiece or casting does not have to be clamped. The time normally consumed in re-positioning angle plates, protractors or other hand tool is eliminated. Machine lays out and scribes vertical and horizontal lines on workpieces up to 48 in. vertically and 36 in. horizontally. Vertical and horizontal scales are marked off in inches with separate adjustable verniers reading to 1/64 in. A lock is provided on the crossarm and column. Vertical scriber rotates 360° and swings horizontally 180°.

Table is cast iron, 50 x 70 in., machine flat and smooth. Guide slots begin 5 in. from edge of the table and are spaced 10 in. thereafter. This provides an accurate guide for machine travel in two directions at 90°. Bulletin available.

Portage Double Quick, Inc, 1026 Sweitzer Ave, Akron 11, Ohio

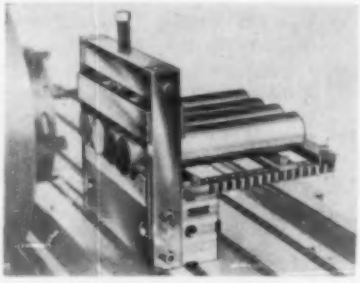


Bliss Hydraulic Presses Range From 10-Ton to 100-Ton Capacity

Latest additions to the company's Hydro-Dynamic press line are several low-tonnage gap frame hydraulic presses, ranging from 10 to 100 tons in capacity. They are designed for high speed operation with quick advance speeds, slowed pressing speeds and rapid returns. Because of their large bed areas, they can handle a wide range of part sizes and shapes. The press stroke is long and adjustable to any point in its length. Thus, the presses can be used for a variety of operations including flash trimming, blanking, drawing, punching and perforating, die spotting and others.

The 35-ton press (illustrated) has a quick approach and rapid return speeds of 693 ipm and a pressing speed of 100 ipm. Its over-all height is 110 in. and it occupies a floor space of 40 x 55 in.

E W Bliss Co, 1375 Raff Rd, SW, Canton 10, Ohio



Gang Fixture Speeds Milling And Grinding Operations

The new Lassy Gang Fixture provides accurate, efficient milling and grinding of a number of pieces at the same time. Compensating jaws

Do the **BIG** jobs . . .
and the small ones too
on a **BRYANT**

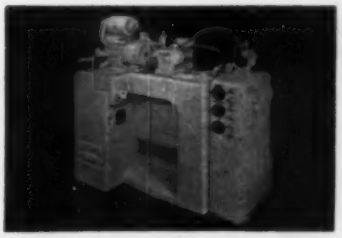
No matter what your internal grinding problem may be, it can be solved effectively with a Bryant Internal Grinder.

Bryant's great variety of manual, semi-automatic and automatic grinders is your assurance of a machine that is tailored to meet your production requirements.

Investigate how Bryant's engineering services can help you attain higher production at lower operating costs.

THE "CENTALIGN", completely new in concept and design, is ideal for the long run, high production grinding of straight bores, tapers and bearing raceways. Maximum swing, 10", grinding stroke, 1".

MODEL 1460 Hydraulically operated. Chuck swing of 60", total wheelslide stroke of 21"; maximum grinding stroke of 16".



MODEL 1109 A precision internal grinder, suitable for covering the range of smaller bore sizes. Total swing of 9"; maximum grinding stroke of 3½".

MODEL 1116 Tops for both toolroom and general production work. Total chuck swing 16"; maximum grinding stroke 8".

MODEL 1316-J Hydraulic Internal Grinder. For combined bore and face grinding. Two wheelheads on a single wheelslide provide exceptional speed, accuracy and versatility. Maximum swing, 16", maximum grinding stroke, 8".

BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

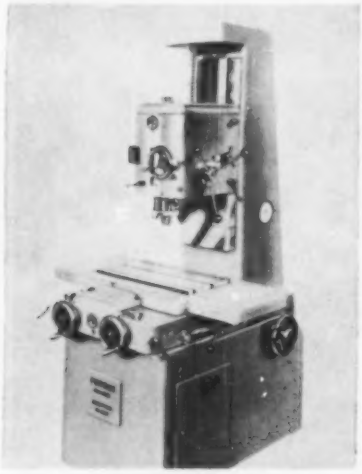
Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

clamp each workpiece with equal pressure, even though the pieces may vary in size by as much as 1/32 in. The springless clamping is positive and constant, and may be controlled to suit the workpieces or operation.

Model shown uses a conventional screw lock but the fixture can be adapted for either air or hydraulic locking. Fixtures can be used vertically or horizontally. Open design eliminates chip problems. Model GF-2 holds from four 2-in.-round, square or oblong pieces down to 128 1/16-in. pieces.

Lassy Tool Co, Plainville, Conn



Jig Borer's Optical System Gives Accurate Readings to 0.0001 in.

Perrin-Swiss jig borer is equipped with a coordinate table incorporating a built-in, Swiss-designed optical system said to insure extreme accuracy. Specially developed device, the Zeromatic Indicator, automatically sets initial measurement point to zero. Optical images can be read on the viewplate from any angle without distortion. It is reported that semi-skilled operators can find complex settings with ease.

Table measures 11 x 20 in. with longitudinal traverse of 16 in. There is 11-in. distance between spindle and column, 18½ in. between spindle and table. Infinitely variable range of spindle speeds from 50 to 3200 rpm is powered by a 2-hp motor. Spindle movement is controlled by rapid manual feed, fine manual feed, and power feed in either direction. Three power feeds are provided: 0.002, 0.004, and 0.008 ipr of spindle. Drilling, reaming, and boring, as well as jig boring are all within the machine's range. Coordinate table can be removed, converting the unit into a highly precise vertical boring machine.

Distributed by S & S Machinery Co, 140 53rd St, Brooklyn 32, NY

12-Ton Power Punchpress Tilts Full 30 Degrees

Model BT-12, 12-ton capacity, has large die space with 5-in. throat and 7-in. shut height. Standard stroke is 1¾ in. with special strokes of ¼ to 3 in. available at additional charge.

Unit with standard stroke is priced at $437.50 for the floor model, and $410 for bench model, fob. Complete specifications available from company.

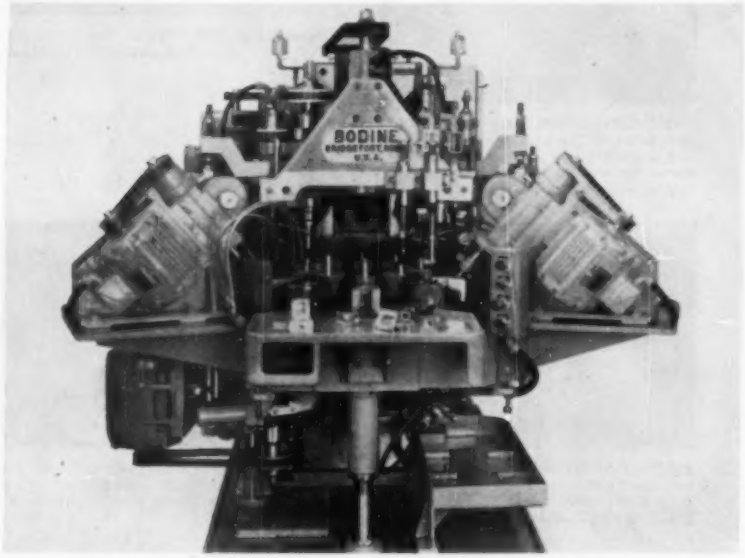
Alva Allen Industries, 1001-15 North 3rd St, Clinton, Mo

Quick-Clamping Toolholder Speeds Setup Time

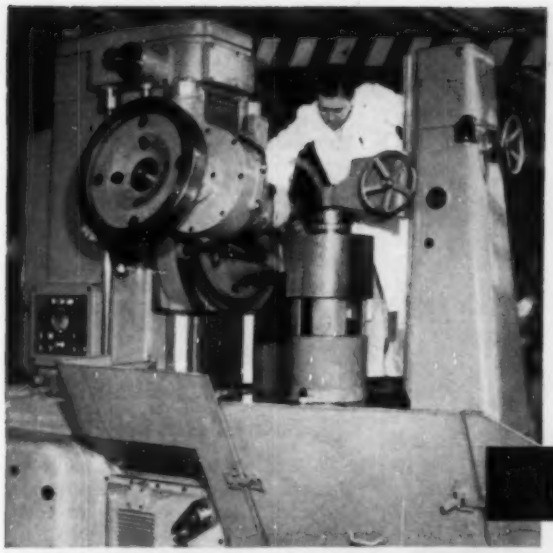
Multifix (Swiss) permits setting of a cutting tool at any desired clearance angle. Correct height of cutting edge is easily adjusted by setscrew. Edge may be ground or cleaned without altering adjustment. Tool change is speeded because the unit can be lifted upward without moving lathe carriage. Tools may be clamped in 40 different positions and successive operations are reported unlimited in number.

Large and long boring bars can be used for drilling and reaming; short or long cutters can be used as required. Tools can be reground without removing them from holders, available in three sizes.

Distributed by G & D Sales Co, Dillerville Rd, Lancaster, Penna



ZINC DIE-CAST VALVE BODIES pass through six separate drilling, tapping and deburring operations on multi-spindle machine. There are spindles operating vertically from both above and below the index table and there are angular spindles at the sides. Unusual feature is use of reversing leadscrew spindles, one vertical and one inverted, for NPT operations. Production is 15 pieces per min—*Bodine Corp, 317 Mountain Grove St, Bridgeport 5, Conn*



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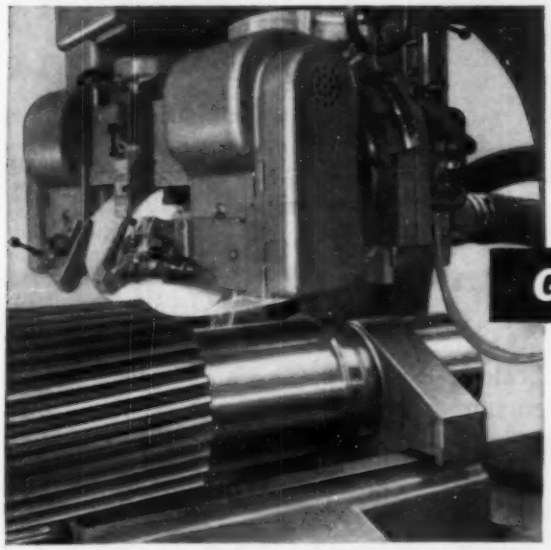
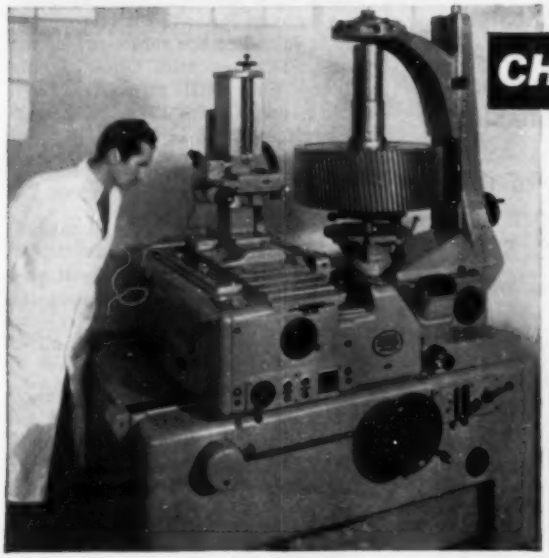
Phillie Gears are **made** r[illegible], then **carefully tested,** and finally **thoroughly inspected** . . . all of these operations are conducted by experienced craftsmen, using the very latest methods and equipment . . . in 4 modern plants.

Send for latest 76 page "Gear Book", G-127.

MADE ACCURATELY



GROUND ACCURATELY



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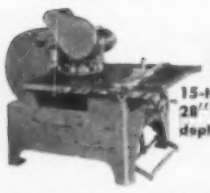
LOCATE and PIERCE in ONE HIGH SPEED OPERATION

. . . even intricate hole patterns are duplicated at almost unbelievably high speed with Wiedemann Turret Punch Presses—from prototype to medium production runs.

Using the high speed follower gauge, illustrated, openings are pierced in printed wiring boards, chassis, panels, truck and other fabricated parts at rates of 30 to 120 holes per minute. Other rapid gauging methods are also available—assuring you a Wiedemann that suits the size and nature of your work.

High speed operation is just one of the many ways a Wiedemann can cut your short run piercing costs 60% to 90%. Get all the facts. Send drawings of your work for time study and write for Bulletin 301.



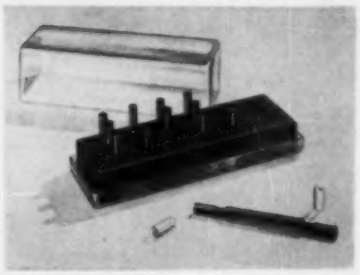
12 to 32 Punches and Dies Ready for Use

BA-41P Wiedemann
15-ton capacity
28" throat
depth

Other models from 4 to 150 tons

WIEDEMANN
MACHINE COMPANY
TURRET PUNCH PRESSES

4217 Wissahickon Ave. Philadelphia 32, Pa.



Go-NoGo Gages Available in Sets With Class XX or X Accuracy

Go-NoGo gages, made of graph-mo oil-hard tool steel (R_c 62-64), are furnished in sets of 13 gages each. Sets range in size from 1/16 to 1 in. The gages within each set are clearly marked with the exact size to four decimal places.

In addition to the deluxe gage sets with Class XX accuracy—from size to plus 20 millionths, the company also offers, at a somewhat lower cost, sets in the Class X field—from minus 20 millionths to plus 40 millionths of an inch.

Each set of gages includes one regular standard aluminum handle with a green collar for the Go gage and a red collar for the NoGo gage.

Prices range from $90 for the 1/16-in. set of Class XX gages to $125 for the 1-in. set. The Class X gages range from $75 to $100 per set. Bulletin available.

K & K Grinding Co, 230 Richardson St, Brooklyn 22, NY

Layout fluid applicator, called Fountain Brush, consists of a soft-hair brush with hollow handle attached to a squeeze bulb; the whole assembly is joined to the screw-cap of the non-breakable bottle. One charging of the bulb will provide enough fluid to cover about 350 sq in. of metal surface. Price is $1.75.

Dykem Co, 2301-B N 11 St, St Louis 6, Mo

Miniature dial bore gage is capable of checking bores down to 0.032 in. Interchangeable heads make it possible to check any bore within the range of 0.032 to 0.064 in.

Boice Gages, Inc, Hyde Park, NY

Speed-Trol variable speed drive integrally combined with a right angle gear reducer is available in drip-proof and totally enclosed models in speeds from 360 to 5.5 rpm and speed variations from 2:1 to 10:1.

Sterling Electric Motors, Inc, 5401 Telegraph Rd, Los Angeles 22, Calif

Ask for a sample TEST BAR

of *La Salle's* revolutionary

fatigue-proof

steel

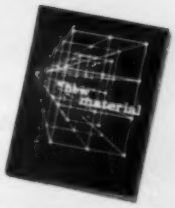
The steel bar that has high strength WITHOUT HEAT TREATING

Yes, La Salle invites you to test a sample bar of the remarkable new FATIGUE-PROOF. This amazing new material is its own best recommendation . . . as proven by the many original equipment manufacturers who have already tested (and are using) FATIGUE-PROOF.

If you are making parts requiring strengths in the tensile range of 140,000 to 150,000 psi, and want to eliminate the expense or problems of heat treating . . . if you want to save production costs with a bar that machines faster (25% faster than annealed alloys—50% to 100% faster than heat treated alloys) and gives you a beautiful finish, too . . . if you want to improve the quality of your product while saving money, send us a blueprint, drop us a note giving application details, or better yet . . . pick up your telephone and call a La Salle sales engineer (REgent 4-7800, Chicago, Illinois).

FREE

Get your copy of "a new material," a 24-page booklet which gives detailed information on La Salle "FATIGUE-PROOF"® steel bars.



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Manufacturers of America's Most Complete Line of Quality Cold-Finished Steel Bars

Please send me your "FATIGUE-PROOF" Bulletin.

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NEW SHOP EQUIPMENT

Impact wrench, hand-operated Model 1000, is said to be capable of delivering all the power that a 1-in. square drive can withstand. Unit is said to deliver torque values up to 15 times that applied by the operator to the handle, making it possible for one man to easily tighten or loosen bolts up to 1¾-in. dia. Model has two drive extensions that fit standard 1-in. square sockets. It is 26½ in. over-all, weighs 23 lbs.

Swenson Engineering, PO Box 43, Branford, Conn

Dynamic balancing machine, Raydyne Automic System designed for handling rotors, uses a seismic-mounted electronically controlled unbalance indicator with a force absorption device that automatically stops all motion caused by unbalance, and reportedly affords accurate balance testing with the first run of the rotor. System is offered as custom-built equipment in several models.

Raydyne Corp, Springfield, Ill

Machine vise, Palmgren No. 80B for heavy duty service, is designed for use on milling machines, shapers, planers, drillpresses, radial drills, and grinders. It is provided with flanges for clamping down to the machine table and may be used with or without the 360° graduated swivel base. Unit has jaws 8 in. wide, opens 8 in., and has a jaw depth of 2½ in.

Chicago Tool & Engineering Co, 8383 S Chicago Ave, Chicago 17, Ill

Vertical motors are furnished in sizes from one to 40 hp for direct mounting on high-thrust pumps, and are available in all standard enclosures, and all standard speeds up to 3600 rpm. Bonnet design of the splash cover permits stacking of additional bearings to absorb high up-and-down thrust loads.

Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio

Welding positioner, RA-100, for manual or automatic operation, has capacity of 100 lbs. Variable-speed drive system is enclosed; turntable, provided with a manual tilt device, is 12 in. in dia. Five speed ranges are available; the 0 to 1.41 rpm range is recommended for manual welding of steel or low-speed aluminum welding; ranges from 0 to 10.5 rpm for high-speed automatic welding. Total weight is 75 lbs.

Raco Engineering Service, 2116 Chestnut Ave, Alhambra, Calif

FIELD REPORT...

$14-Million Computer Order Goes to Ford Instrument Co

Navy has contracted with Ford Instrument, Division of Sperry Rand, Long Island City, NY, for production of electronic computers for the Tartar and Terrier guided-missile systems. Ford designed and developed the equipment for ordnance use on destroyers and cruisers.

Temco Aircraft Uses . . .

. . . approximately 12 tons of titanium a month, priced at $30,000 per ton. Parts fabricated by the company include high-temp aft fuselage for the McDonnell F-101 (1207 mph), and photo noses for the reconnaissance version of the Voodoo, the RF-101. Temco uses more than 10,000 titanium parts each month on various subcontract programs.

Jones & Laughlin . . .

. . . will re-open its Cleveland works during the first week of July after a three-month shutdown. Company has recently completed a $90 million expansion at the plant including installation of major new equipment.

Johns-Manville Equips Itself To Mass-Produce Teflon Items

Installation of a line of latest automatic machines of various types designed to turn out a range of Teflon products has been completed by J-M. The Chempac line of products

"Cutting oil? What's that?"

shamrock *top performer for automatic screw machines*

Shamrock, a water-soluble chemical emulsion combining good cooling and extreme-pressure lubricating properties, is giving excellent service in single and multiple spindle automatic screw machines. It is also widely used when machining at moderate feeds and speeds for broaching, threading and tapping, as well as for drawing and stamping. It contains no sulfur or chlorine commonly used as extreme pressure additives, and it completely eliminates all smoke nuisance as well as the dermatitis problem. Shamrock helps keep any shop clean.

IN CHICAGO:
Anderson Oil and Chemical Co., Inc.
9 So. Clinton St., FInancial 6-0955

IN DETROIT:
Anderson Oil and Chemical Co., Inc.
10234 Grand River, Texas 4-7676

IN CLEVELAND:
K. E. Karlson Company
3537 Lee Rd., Washington 1-3875

IN DAYTON:
Dayton Industrial Supply Co., Inc.
45 Catherine St., Baldwin 6-2761

IN CINCINNATI:
Monroe & Co.
3329 Reading Rd., Woodburn 1-7534

Send for descriptive literature

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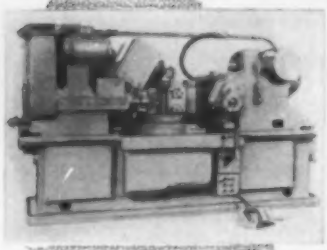
BETTER PRODUCTS FOR BETTER METALWORKING

ANDERSON OIL and CHEMICAL COMPANY, INC.

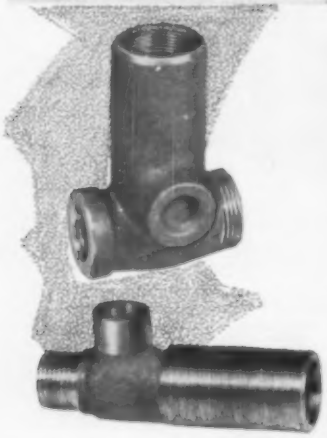
BOX 213, PORTLAND, CONNECTICUT

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore, it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.



The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

GOSS & DeLEEUW QUALITY PRODUCT-QUANTITY

Field Report . . .

will include molded and machined parts, tape, sheet, sheet and cut gaskets, extruded rods and tubes, molded rods and tubes, and asbestos-Teflon packings and gaskets. Fabrication of Teflon in quantity, made possible by the new equipment, cuts weeks from former delivery schedules, according to J-M.

American Motors Boosts Output

Company is hiring an additional 1200 workers because of stepped-up production of Ramblers—from current 750 to 835 a day. Main assembly plant at Kenosha, Wis, is taking on 450 employees; Milwaukee body plant is adding a second shift and hiring 750 more.

Employment at AM is higher than a year ago. Including the latest increase, company's total of hourly rated automotive workers will be 11,900 compared with 8900 last June.

Western Gear Corp, Seattle . . .

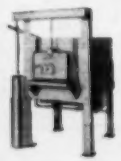
. . . has orders for $1.5 million worth of deck machinery for four new Moore-McCormack Lines cargo-passenger vessels. Contracts came from Sun Shipbuilding & Drydock Co, of Chester, Penna, which will build two of the ships; other two will be built by Todd Shipyards at San Pedro, Calif.

US Industries Expands

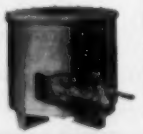
Western Design & Mfg Corp, Santa Barbara, and Axelson Aviation, Montebello, Calif, have been consolidated into an integrated division of US Industries, Inc. Both companies will operate under the Western corporate name, with more than

"Finish—smooth enough for a fly to skid and break its neck on. . . Now who's the wise guy that thought that up. . . ?"

SURFACE


small oven

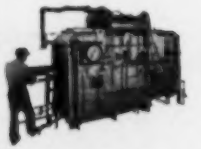
laboratory


circular pot

rivet heater

rectangular pot

continuous snap hearth


continuous link belt

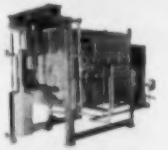
tilting metal melting

stationary metal melting

forge

horizontal muffle

MDX® gas generator


balco® atmosphere

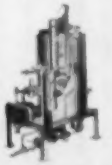
allcase® atmosphere

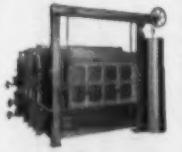
soft metal melting

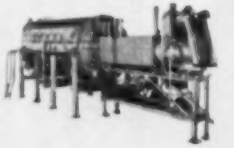
aluminum melting-holding

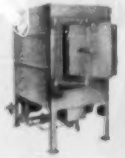
brazing

indirect air heaters


MRX® gas generator


large oven


stainless steel


horizontal convection

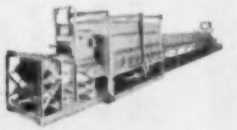
vertical convection

direct air heaters

vertical muffle

MAX® gas generator

sintering


continuous brazing

widest selection

You can select exactly what you need from the broad Surface line of Standard Rated equipment. Modifications are possible for unusual requirements.

known production rates

Rated production makes it easy to determine quantity of finished product which a Surface unit will produce in any given time.

known operating costs

Figures and performance curves on all units clearly show in advance your operating cost per pound of finished product.

quick delivery

Surface standardization permits stocking the same parts for many different furnaces; cuts engineering and procurement time.

write for Bulletin SC-175

Surface Combustion Corporation
2365 Dorr Street, Toledo 1, Ohio. In Canada: Surface Industrial Furnaces, Ltd., Toronto, Ont.

Surface

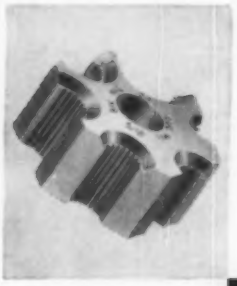
wherever heat is used in industry

GIVING YOU

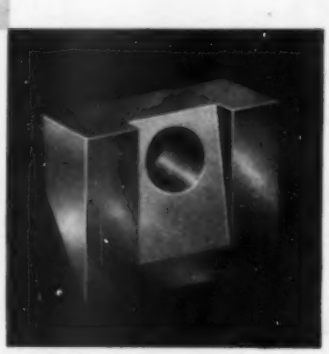
...the best and most modern!

Bunting today covers a new area in the engineering and manufacture of bearings and machine parts. To the traditional line of Bunting Cast Bronze Bearings and parts is added up-to-date, soundly established facilities for engineering and manufacturing bearings and parts made of Sintered Powdered Metals.

In an entirely new plant with the very latest equipment, Bunting now attains the position in the Sintered Powdered Metals field which it has long held in the field of Cast Bronze Bearings.



A competent group of Bunting Sales Engineers in the field and a fully staffed Product Engineering Department put at your command, comprehensive data and facts based on wide experience in the designing and use of Cast Bronze and Sintered Powdered Metal Bearings and parts.



Write for catalogs and your copy of the new 24 page Bunting Engineering handbook of Sintered Powdered products and their composition, manufacture and application.

Bunting®

BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

Field Report . . .

250,000 sq ft of plant space available. Western has been manufacturing electronic and electromechanical systems and components for the aircraft, missile, and marine industries. Axelson has been engaged in building aircraft landing gears, shock struts, and pneumatic equipment, and will now enlarge its scope to include hydraulic assemblies, mechanical drives, and other support equipment.

Chevrolet Reports . . .

. . . that its retailers delivered 539,600 new cars in the first five months of this year. Total compares with 598,900 in the 1957 period. Last ten days of May with 45,525 new car sales was best such period of the year, January was next best with 41,223 sales.

Food Machinery & Chemical Corp

. . . will add 52,000 sq ft of working area to its 9-acre plant in San Jose, Calif, to make room for production of ground handling and launching equipment for the Douglas Thor missile and the Boeing Bomarc. The half-million-dollar addition is scheduled to be in use by July 15.

Lockheed Missile Systems Div . . .

. . . has been authorized by the Navy to start construction of an addition to the Polaris development facility at Sunnyvale, Calif. Expansion will provide a manufacturing capability, available when research and development phases are completed. Site preparation is already under way on the multi-million-dollar construction

"The foreman told me that I was like another right hand to him . . . then I found out he was left-handed!"

Measure in Millionths

Now you can see ten millionths of an inch . . . Easily estimate five millionths . . . with Ames Portable Transistorized Comparator.

An amazingly sensitive comparator, Ames Porta-Check now makes it possible to get accurate measurements—*in millionths of an inch*—anywhere in the plant. Use it on the production line; at quality control check points; in the tool room—wherever you need it!

Porta-Check converts minute dimensional variations to voltage changes and amplifies them so they can be read easily and accurately. The meter dial—shown in actual size—can be used as either a "tenths" scale or a "thousandths" scale by simply setting the front panel rotary switch.

As a "tenths" scale it is graduated directly to *ten millionths*. With the generous spacing between graduations it is easy to estimate *five millionths*. Total range on this scale is .0006".

As a "thousandths" scale it is graduated directly to .0001", making it simple to estimate "half tenths". Total range on this scale is .006".

The low friction pick-up head is unaffected by environmental conditions and uses no mechanical magnifications. In fact, the pick-up tip, which is the only moving part in the pick-up head is supported by a blade fulcrum bearing that is frictionless and free from bind, play or wear.

Check these exclusive Porta-Check features

1. Completely Transistorized (no vacuum tubes)
2. Low cost, long life batteries provide power
3. Lightweight, portable—use it anywhere in the plant
4. Accurate, Sensitive, Rugged
5. Simultaneous zero setting for both scales
6. Simultaneous magnification setting for both scales
7. Two scales: "Tenth" scale graduated to *ten millionths*

   "Thousandths" scale graduated to .0001"

The new Ames Porta-Check is truly the most accurate portable comparator available today—and it's low in cost! See your local Ames representative or write directly to the factory for complete details.

Representatives in Principal Cities

B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

Canadian Representative—J. B. Morrison Machinery Co., Ltd., 45 Ovide Parkway, Toronto

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAUGES

WHY Pratt & Whitney MICROHONES Bores In Titanium Spacers

Rotor disc spacers, that are used in jet engines, require accurate bores having consistent surface finish. Thus, the final processing method must generate bores with diametric and geometric accuracies within .0005" and consistent finishes of 15 microinches.

But, Pratt & Whitney Aircraft Division, U.A.C., faced additional problems in selecting the final processing method for these .110" length bores in titanium spacers. Because the spacers are manufactured in 20 different heights and bores in two diameters, efficient production demanded extreme versatility of the processing method used.

Here's why Pratt & Whitney chose the Microhoning process and equipment to economically produce the required results: Microhoning, in removing .004" of stock from each bore, accurately holds to size and finish requirements; and because the fixturing positions all 20 spacer heights at same work level, the tool stroke never needs adjustment. The Microhoning of all 16 bores in each titanium spacer is completed in about 7 minutes (including loading and unloading time).

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Field Report . . .

job, originally scheduled to begin next year. Accelerated tempo of the entire Polaris weapon system has advanced the starting date.

$65 Million R & D Facilities

Air Force will construct research and development facilities in Denver for nuclear propulsion units for manned aircraft. Initial cost will be $22.5 million with eventual cost totaling $65 million. Laboratories will hire about 3000 workers, 1200 of them scientists and technicians. Construction will start late this summer with completion scheduled within three years.

General Motors . . .

. . . reports 1957 payrolls for an average of 3232 employees in the San Francisco Bay Area amounted to about $17.3 million. Company has two assembly plants in Oakland—Chevrolet, and a Fisher Body Division.

Hercules Powder Co . . .

. . . has a $14.9 million contract from the Army for manufacture of airplane propellers, rockets, and other defense items. Work will be carried out at the Radford, Va, plant.

Cutler-Hammer Acquisition

Airborne Instruments Laboratory Inc, Mineola, NY, electronics company, has been taken over by Cutler-Hammer, Milwaukee electrical control firm. AIL will operate as the Electronics Division of C-H. Air-

"There you are—good as new."

borne, currently employing 1500, specializes in the application of electronics to radar, microwave, data-processing equipment, and the design and production of systems for the military and industry. A new 160,000-sq-ft plant is under construction on a 50-acre tract of land at Melville, NY.

Electra Prop-Jet Order

Lockheed Aircraft has new orders totaling $27 million for 11 Electra prop-jets, raising the Electra backlog to 151 planes worth almost $375 million. Orders were placed by four major airlines in the Australia-New Zealand complex.

Topp Manufacturing Co Order

The Los Angeles Division of Topp Industries, Inc, has a contract in excess of $1.1 million from Aviation Supply Office, Philadelphia, for angle-of-attack detectors, indicators, computers, and other related units. System is intended for use on an unspecified Navy fighter.

Yuba Consolidated Industries . . .

. . . has made its second acquisition in the field of powered home tools with the purchase of Weber Engineered Products, Inc, Cincinnati maker of the Choremaster line. Yuba also owns Magna Power Tool Corp.

Westinghouse Electric . . .

. . . has a $10 million contract from Boeing Airplane to develop and test an advanced ground control system to guide the supersonic Bomarc missile.

"I hope it doesn't cause you any inconvenience Gus but our spray paint hose broke last night and painted all of your wires the same color."

HOW Pratt & Whitney MICROHONES Bores In Titanium Spacers

By Microhoning the bores in rotor disc spacers used in jet engines, Pratt & Whitney obtains final stock removal that efficiently produces close diametric and geometric accuracies (within .0005″) and consistent surface finishes of 15 microinches.

Here's how a Hydrohoner produces these accurate results in 20 different sizes of titanium spacers . . . each spacer having 16 bores that are either .680″ or .590″ in diameter and .110″ in length.

The Hydrohoner is equipped with precise feed and sizing controls that automatically expand and collapse the tool, compensate for abrasive wear, and terminate the Microhoning cycle when required bore size is reached. Also, because fixturing is designed to position all spacers at the same work level, the tool stroke never needs adjustment.

A rotary indexing table automatically locates each bore under the spindle and stops the Hydrohoner when all 16 bores in each spacer are finished. A lateral indexing feature positions the fixture to accommodate various spacer sizes. In fixture change-over, no special tools are required for simple exchanging of four details, and the switch from one spacer size to another requires but a few minutes.

☐ Please send me your movie "Progress in Precision" in time for showing on _____ (date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

Don't let established practices kill your production potential!

The Detroit SCREWMATIC 750 was designed not to lessen or circumvent, but to *overcome*, the recognized shortcomings of ordinary single spindle bar automatic screw machines — basically, their limitations in part-length capacity and spindle speeds.

The result of this new approach to screw machine design? Six infinitely selectable spindle speeds in one cycle, forward or reverse, and a normal part-length capacity of more than 10 times maximum spindle capacity!

LONGER PARTS— WITHOUT 'TRICK' TOOLING

Conventional single spindle automatics, limited to part-length of about 2½ times spindle capacity, reduce the variety of parts that can be scheduled. But the SCREWMATIC 750 eliminates this limitation, as well as the need for "trick" tooling to produce extra-long shafts with turned, threaded or tapped ends.

The standard ¾" - diameter SCREWMATIC's turret-to-collet clearance of 9½" is extended to 18½" by the addition of a simple coupling to the camshaft and an extension to the micrometer adjusting screw. Even with this clearance available, machining is still done in a conventional manner, quickly, efficiently, and at lower unit cost.

MORE SPEEDS FOR MODERN METALCUTTING

With the cutting tools and metals now available (and often necessary) for many new products, it becomes increasingly important to have a greater selection of spindle speeds. The SCREWMATIC's variable-speed drive motor and instant-reversing transmission make it possible to assign a different speed to six different cutting operations—with speeds in any cycle fully selectable from 50 to 7200 RPM.

Because modern metalcutting demands not only extremely high speeds, but the *correct* speed for specific metals and tools, the infinite spindle speed selection is a *standard* feature of the SCREWMATIC 750 — assuring proper cutting speed, plus less downtime because of longer tool life.

A NEW APPROACH TO PRODUCTION

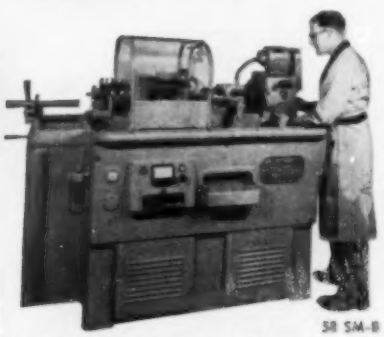
With turning speeds and part-length no longer limiting factors to volume production, many parts formerly manufactured in multiple automatics, hand screw machines and ordinary lathes are now machined economically, with a minimum of special tooling. Secondary operations and additional parts handling are eliminated, permitting greater latitude for the product engineer. Progress in production can only be achieved by taking advantage of new machine design. In the SCREWMATIC 750, electronic speed control is one such advancement from the conventional past. Long part-length capacity is another achievement.

The Detroit SCREWMATIC 750 has extended the potential for single spindle bar automatics. But there's a great deal more to the story than is told here. We'd welcome the opportunity to tell you how the SCREWMATIC 750 can extend *your* potential beyond the bonds of established practice.

FREE

—1958 Detroit SCREWMATIC 750 Catalog. Profusely illustrated 16-page Catalog describes in detail all the important features of Model 201 and Model 301 SCREWMATICS. Closeup photos and description of major assemblies, including transmission, clutches, slides, controls and SCREWMATIC'S cost - cutting "unit construction" design. Gives complete specifications, operating capacities and floor plan layout. Also included: New SCREWMATIC Accessory and Attachment Sheets — includes Magazine - loading Bar Feed, Air-clamping, Pick-up Arm and Universal Roller Work Support. SEND FOR YOURS TODAY!

DETROIT Screw Matic 750



58 SM-8

THE GEAR GRINDING MACHINE COMPANY

3935 CHRISTOPHER DETROIT 11, MICHIGAN

MANUFACTURERS OF: FULLY AUTOMATIC GEAR GRINDING MACHINES. RZEPPA (SHEPPA) CONSTANT VELOCITY UNIVERSAL JOINTS.

N M Forsythe, vice president and general manager of National Automatic Tool Co, has been elected president to succeed **Harry W Bockhoff** who will continue as chairman of the board

James A D Geier has been elected vice president of Cincinnati Lathe & Tool Co and appointed assistant general manager. He was formerly assistant to the sales manager

Raymond E Breitung has been appointed sales manager of foundry products for the Kaukauna Machine & Foundry Division of Giddings & Lewis Machine Tool Co. He was formerly purchasing agent for the G&L and Hypro Division

NAMES IN THE NEWS...

Henry M Heyn has been elected president of Surface Combustion Corp, Toledo, and president of the Industrial Division. He was previously vice president and general manager of the Division. **Robin A Bell,** vice president and general manager of the Janitrol Division, Columbus, has been elected executive vice president of the corporation and president of the Division.

L G Porter has been elected president and general manager of the Long Manufacturing Division of Borg-Warner Corp in Detroit and Long Manufacturing Co, Ltd, of Canada, a subsidiary. Mr Porter, who is also executive vice president of B-W, succeeds **T J Ault** who has resigned as president of Long, effective July 1, to become president of Saco-Lowell Shops. **Harry H Whittingham** has been named assistant general manager of the Long Manufacturing Division in addition to continuing as its vice president. **Charles F Stevenson** continues as executive vice president of Long Manufacturing Co, Ltd, at Oakville, Ont.

Harold H Gillespie, formerly vice president and assistant general manager of Barden Corp, has been appointed general manager of the Split Ballbearing Division of Miniature Precision Bearings, Inc, Lebanon, NH. **Frank Stearns,** who has been serving as acting general manager since the retirement of **Raymond F Gardner,** will resume his former duties as assistant general manager and chief engineer of the Division.

Howard D Campbell, treasurer of Campbell Chain Co, York, Penna, has been made vice president, manufacturing. **Gustave A Blum,** plant superintendent, has been named 2nd vice president, manufacturing.

Morris Winston, Diamond Drill Carbon Co, New York, has been elected president of the Industrial Diamond Association of America. **Donald J Wallace,** Wheel Trueing Co, Detroit, is new 1st vice president, and **Bernard Jolis,** US Industrial Diamond Corp, New York, 2nd vice president.

OBITUARIES

William Hunt Eisenman, 73, secretary and a founder-member of the American Society for Metals, died May 30 in LaJolla, Calif. Mr Eisenman served ASM for 40 years and was managing director of the National Metal Exposition and Congress (Metal Show). He was the originator and secretary general of the first World Metallurgical Congress at Detroit in 1951 and of the second Congress at Chicago in 1957.

Fred C Dull, 63, vice president-treasurer of Monarch Machine Tool Co, Sidney, Ohio, died June 1. Mr Dull had been associated with Monarch for the past 40 years. He was elected to the board of directors and made vice president and secretary in 1929, added the responsibilities of treasurer in 1946, and was named vice president-treasurer last year.

Ernest G de Coriolis, 75, director of research for Surface Combustion Corp, Toledo, and a specialist in the industrial heating field, died May 18.

Admiral Joseph James Clark, US Navy (Ret), has joined Van Norman Industries, Inc, as assistant to the president. He will coordinate research and development among the company's eight manufacturing divisions

F B Weber, formerly sales manager for Micromatic Hone Corp, has been appointed general sales manager of Lanco Corp, Berkley, Mich, designer and producer of special purpose machinery and tooling

The Taft-Peirce Versachek is unique because of its flexibility. Laboratory instruments like digital voltmeters, ink recorders, and oscilloscopes can be attached to special output. It can be used in gage lab, inspection department, or beside machine.

Tolerances can be spread over wide range with four magnifications. Wide graduation spacing provides faster reading, greater accuracy . . . no squinting, no judging.

Low-Cost, Easy-to-use VERSACHEK Ideal for Multi-Purpose Gaging

New Electronic gage features four magnification ranges, simple calibration, fast setup.

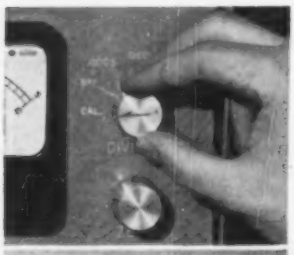
The Taft-Peirce Versachek is a micro-accurate electronic gage which converts minute dimensional differences into voltage changes, and amplifies them to be read on a graduated meter scale.

Check these important features . . .

- One meter — four magnifications: 400:1; 2,000:1; 4,000:1; and 20,000:1.
- Exclusive self-calibrating circuit: Full scale accuracy can be checked without reference to gage blocks.
- Quick, accurate readings: Immediate meter response using cables of any length.
- Fast setup: Meter hand is quickly zero-centered with gage blocks . . . stays on center at all magnifications.
- Simplified operation: Accuracy not affected by line voltage fluctuations; special lights indicate scale in use.

The Taft-Peirce Versachek has unlimited applications. It is perfectly suited for checking working gages against masters, for inspecting high precision small parts, for toolroom checking of jig grinder work, and for checking accuracy of machine tool setups. Does everything a dial indicator can do with far greater accuracy and surer results.

Look into the Versachek, now! Send for additional data, or order from nearest Taft-Peirce representative.



EXCLUSIVE SELF-CALIBRATING CIRCUIT

1. With meter hand on zero, turn range switch to CAL (calibrate) position.
2. Meter hand swings from zero to extreme end graduation, proving accuracy of magnification without reference to gage blocks.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

NAMES IN THE NEWS...

James Peterson has joined Cyril Bath Co as chief engineer. He was formerly supervisor of special machine design and manufacturing of test equipment at Chance Vought Aircraft

Philip S Fogg who has been serving as board chairman and chief executive officer of Consolidated Electrodynamics Corp, Pasadena, Calif, since relinquishing the presidency in June 1956, has been reappointed president. He will continue to head the board. **Hugh F Colvin,** formerly president, has been appointed senior vice president in charge of Pasadena divisions. Named CEC vice presidents: **Kennett W Patrick,** director of the Transducer Division, and **Frank M Jenner,** general manager, Rochester, NY, division.

James W Dunham, vice president of Chemetron Corp, has been elected president of Midwest Carbide Corp, Keokuk, Iowa, affiliate of Chemetron. He succeeds **L F Loutrel,** named board chairman.

J S Wadsworth, assistant to the general manager of Littleford Bros, Inc, Cincinnati fabricator of plate and sheet metal, has been elected president of the company to succeed **R S Littleford,** named board chairman. **J B Meyer,** named vice president and treasurer, will continue to serve as general manager.

Robert C Baumgartner has been promoted from general sales manager to vice president of Oster Manufacturing Co, Wickliffe, Ohio.

J E Brown, assistant vice president of Zenith Radio Corp, has been elected vice president, engineering, to succeed the late **Gilbert E Gustafson.**

Ray M Ronald, vice president in charge of Hyster Co's Tractor Equipment Division, and **Frank A Rostedt,** managing director of the plant in

Nijmegen, The Netherlands, have both been appointed vice presidents of the company.

Howard A Patrick has been appointed works manager of Magnetic Metals Co, Camden, NJ, fabricator of electro-magnetic core parts.

Blaz A Lucas, Jr, factory manager of the Ingersoll Products Division of Borg-Warner Corp, has been named divisional sales manager. He succeeds **Robert A Anderson** who is retiring as vice president, sales.

Hodge C Morgan has been appointed manager of the industrial communications and electronics department for the Radio Division of Bendix Aviation Corp at Towson, Md. He was formerly assistant to the vice president of Bendix.

William C Wichman, has been named general manager of the Hotpoint Co, Chicago division of General Electric. A GE vice president, Mr Wichman succeeds **John C Sharp** who is retiring.

J L Molner, general superintendent of National Acme Co, has been promoted to chief engineer

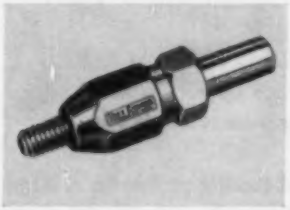
I Nevin Palley, vice president, engineering, of Temco Aircraft Corp, Dallas, has been promoted to senior vice president. **Robert E Galer,** manager of engineering programs, takes over Mr Palley's former duties.

Donald S Foote has been appointed works manager of Crucible Steel's Titanium Division at Midland, Penna. He was previously superintendent, process and product development, for the Division.

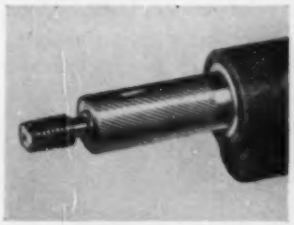
Grant A Morrison, formerly engineering administrator, has been appointed manager of product design and application engineering at the Metallurgical Products Department of General Electric Co, Detroit.

Cut Thread Gaging Costs with Taft-Peirce Rotochek®

Thread Ring Adapter



Reversible Thread Plug Adapter



Taper Lock Plugs Mount in tapered sleeves

Mechanize your Thread Gaging with Taft-Peirce Rotochek. Takes A.G.D. standard thread plug (taper shank and reversible), and thread ring gages. Rotochek is also adaptable to many special thread gaging problems. Call on Taft-Peirce for advice.

Push! Pull! And the part is inspected! Thread gaging is as simple as that when you mechanize with the Taft-Peirce Rotochek. It's fast, accurate and easy to use . . . actually makes it possible to triple your thread inspection rate, increase sampling, or perform 100% parts inspection — without sacrificing quality or adding manpower.

Available in bench and flexible shaft models. A slight push and the gage rotates in, release pressure and Rotochek stops, pull and it disengages. Special clutch-controlled power does all the work.

Want more information? This is your opportunity to take a real cost-saving look at your gaging operation. Send for Bulletin #612 with complete description and prices.

TAKE IT TO TAFT-PEIRCE T P

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

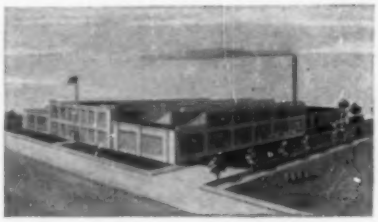
CDT can help you cut costs

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



FREE: *New brochure listing facilities, equipment, etc. Write today.*

Columbus Die-Tool
AND MACHINE COMPANY
P.O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NEW FILMS . . .

TWO BILLION ROLLS. *Produced by Minnesota Mining & Manufacturing Co, 900 Bush St, St Paul, Minn. 16 mm, sound, color. Running time 32 min. No charge.*

Economies of proper tape usage and the advantages of mechanically dispensed and applied pressure-sensitive tapes are demonstrated by on-the-job sequences shot in plants around the country. Examples range from labeling chain automatically with tape labels to making a filter-proof cover on prepunched kitchen cleanser can lids. Included is a simplified explanation of how "Scotch" tapes are designed for specific uses through various combinations of backing and adhesive.

•

THE CONCEPT AND PRINCIPLES OF FUNCTIONAL DRAFTING. *Produced by Industrial Education Institute, 25 Huntington Ave, Boston 16, Mass. 16 mm, sound. Running time 20 min.*

For the first time on film, the basic concepts and fundamental principles of simplified drafting are fully explained and demonstrated. This makes it possible for companies to indoctrinate draftsmen, designers, and engineers, as well as the men who must interpret their work, with the philosophy and principles of simplified drafting, economically and efficiently. The film shows the man on the board how the technique can reduce drudgery and make him more valuable to himself and to his company.

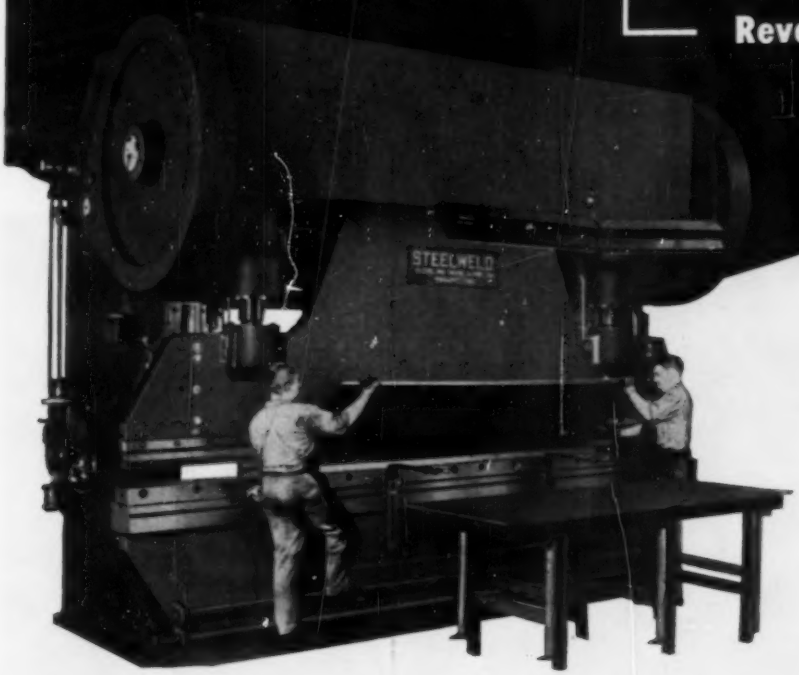
Outstanding feature is the illustration of the twelve fundamental principles that every draftsman, designer, and engineer can apply to make drawings easier to produce, read, and interpret.

•

HIGH PRODUCTION PRESS MAINTENANCE. *Produced by E W Bliss Co, Canton, Ohio. 16 mm, sound, color. Running time 25 min. No charge.*

Proper maintenance procedures for high-speed presses, including lubrication, adjusting, and checking clearances, are described in this new film. Special emphasis is given to the fast, simple die change-over method which makes possible the use of these presses for short runs. Step-by-step construction of a high-production press is also shown.

Reversing Ram Simplifies Press Operation



Model MO 6-12. Handles plate to 16'-6" x 7/16". Other Steelwelds available [illegible] working plate to 24 feet and [illegible]ckn[illegible]sses to one inch.

With a reversing ram drive you can back the ram or upper die away from the work at any point in the stroke. It is not necessary for the ram to continue through in one direction as when only the normal press drive is provided.

This feature speeds locating the correct ram position to achieve a specified bend or shape. It saves time and spoilage when trying new dies.

Reversing ram machines have two complete drives, including motor, flywheel and clutch. They are controlled by individual foot pedals on two different shafts, located one above the other across the front of the press.

The reversing ram featu[illegible]e is optional and may be provided on any Steelweld Bending Press. It adds greatly to the ease of operation and because of time-savings it enables, rapidly absorbs the extra original cost.

Steelweld Bending Presses are such versatile tools with so many outstanding features that we urge you to learn all about them. As a starter, send for the catalog below.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1437 EAST 281st STREET, WICKLIFFE, OHIO

STEELWELD

PRESS BRAKES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

This valve gets a leak-proof seal from a Blanchard Surface Grinder

"The Blanchard Surface Grinder is one of the most important improvements in our modernization program." This report comes from the Commercial Refrigeration Division of Bendix-Westinghouse Automotive Air Brake Company—makers of power and condensing units for refrigeration equipment.

The Blanchard No. 18 Surface Grinder puts a surface of 5 micro inches or better on Bendix-Westinghouse valves at the rate of 75 pieces an hour.

A Blanchard Model 18 Surface Grinder is used to finish grind valve plates used in Bendix-Westinghouse electric refrigeration compressors. They say: "This operation is very important, because—with a surface finish of five micro inches or better—we get a perfect seal on our gaskets and valves, eliminating the possibility of leakage."

Is there room for improvement in *your* surface grinding? For best results...

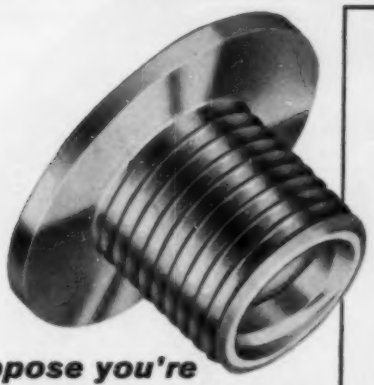
PUT IT ON THE BLANCHARD

Write today for your free copy of "Work done on the Blanchard," fifth edition, and "The Art of Blanchard Surface Grinding," fourth edition.

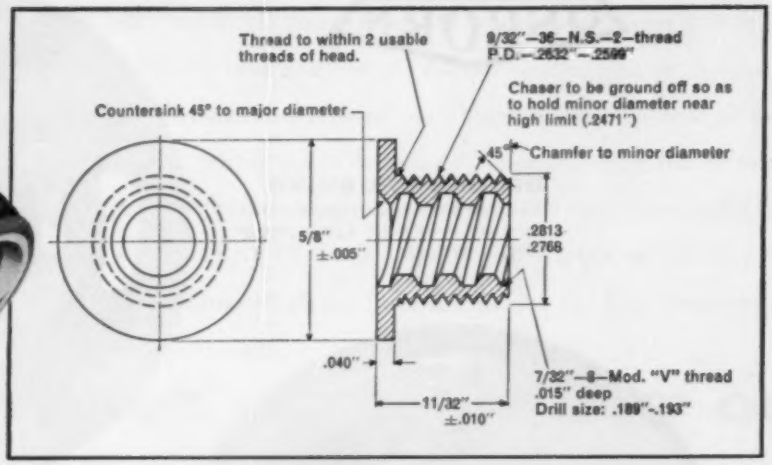
THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

BETTER MACHINING STARTS WITH ALCOA SCREW MACHINE STOCK



Suppose you're handed this part to turn out...



Alcoa Aluminum will give up to 4 times higher cut-off feed

Operations in this flange bushing layout include internal and external threading with an extremely thin wall at the root of the threads. It's not an easy part to make.

But notice the high feeds with Alcoa® Aluminum Screw Machine Stock (2011-T3). Cut-off feed is .0042/rev—up to 4 times higher than with other materials. And the surface speeds: tap is 56.5 fpm; threading tool is 73 fpm; stock is 634 fpm.

So much for speed. What about quality? Alcoa Aluminum retains the surface finishes produced by machining—cut-off finish is superior. You can polish, buff, brush or burnish aluminum—and parts don't deteriorate in storage.

Convenience? Aluminum's light weight means easier handling, faster stock-up time. Because aluminum doesn't punish your tools, there's less downtime for maintenance. Aluminum means less heat—you can use lighter oils. Alcoa 2011-T3 gives top spindle speeds and fewer chip problems. Result: Lower Costs.

Find out more about better machining with Alcoa Aluminum Screw Machine Stock. Here's how to do it:

- Meet Tom Conroy, Alcoa's Screw Machine Specialist and field consultant. He will be glad to demonstrate aluminum's advantages. See coupon.
- Send for free book, *Alcoa Aluminum in Automatic Screw Machines*. It's a valuable procedures manual written for production men.
- Ask for immediate stock delivery by calling your nearest Alcoa sales office or Alcoa distributor.

MULTIPLE SPINDLE LAYOUT

PC. NO. V5-1248	**TIME PER PC.** 1495/hr.	**DATE** 4-8-58
MACHINE 1" N.B.—Mod. 60	**MATERIAL SIZE** 5/8" Rd.	**MATERIAL GRADE** 2011-T3
SPINDLE R.P.M. 3875	**CHUCKS** 5/8" Rd.	**FINGERS** 5/8" Rd.
SPINDLE GEARS 89-31	**FEED GEARS** 71-49	
KIND OF THREADING SPINDLE N.B.	**RATIO** .255 **ON** .498 **OFF**	
THREADING 990 **REV.**	**TOTAL USABLE REV./PC.** 74.3	
SURFACE SPEED 634 Stock 73 Die 56.5 Tap **FT. PER MIN.**	**MIN. INDEX TIME** 1.18 **SEC.**	

SEQUENCE OF OPERATIONS

OPERATION	RISE	LEV.	FEED	CAM NO.	TOOL	HOLDERS
1—Box .281" Dia.	.625		.0084	5/8	Pick-up Std.	# 22 B.&S. Box Tool
Center					Pick-up Std.	in above Tool
2—Drill .193" Dia.			.0084	5/8	4.9 mm Drill	# 14 B.&S. Floating
3—Recess			.0021	5/8	V5-1248	N.B. Recess Tool
4—Thread				V5-1248	9/32-36 NS-2 Chasers	# 101 H.&S. Die Head
5—Chamfer			.0084	5/8	Pick-up Std.	# 22D B.&S. Center & Face
6—Tap				V5-1248	7/32-8 Mod. "V" Tap	# 22F B.&S. Releasing Tap
Cut-off	.3125		.0042	5/16	1/4 Str. Blade Ground to .187"	N.B. Inside

REMARKS: 1/4" c/o Blade Ground to Break Down for Box Tool.

Look for this label . . . it's your guide to the best in aluminum value.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

Aluminum Company of America
868-T Alcoa Building, Pittsburgh 19, Pa.

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☐ Hear from Tom Conroy.

☐ Have a copy of *Alcoa Aluminum in Automatic Screw Machines.*

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Position_____

Company_____

Address_____

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OSBORN

BEFORE BRUSHING

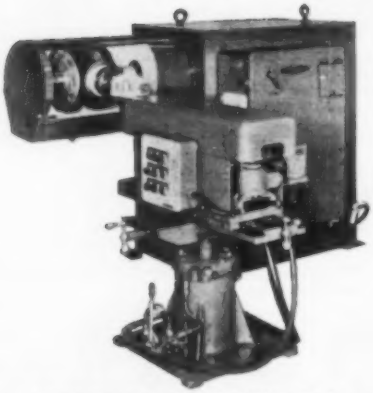
Port plate for hydraulic pump has loose burrs and sharp edges. Cost to remove these by hand: 14¢

AFTER BRUSHING

All burrs are thoroughly removed and surface junctures blended to close uniformity. Cost with Brushamatic: 1.3¢

Quality when the pressure's on

. . . but costs 91% less when finished with OSBORN Brushamatic® Methods



OSBORN BRUSHAMATIC® 3-A
operates on preset time cycles.

These port plates for hydraulic pumps are quality finished to precision tolerances to provide positive seal against high internal fluid pressures. For peak dependability in severe hydraulic service, surface junctures are uniformly blended in one simple, automatic operation with Osborn's Brushamatic Machine. At the same time, all burrs are thoroughly removed to eliminate subsequent fouling of hydraulic controls.

Production rate . . . both sides finished, 180 pieces per hour with Osborn Matic® Brushes.

Low cost, precision finishing like this may be applied to many types of products you now build. An **O**sborn **B**rushing **A**nalysis, made in your plant at no obligation, can show you how to speed production . . . cut costs . . . improve product quality. Write us for details—and for your copy of the 20-page Brushamatic booklet. *The Osborn Manufacturing Company, Dept. C-72, Cleveland 14, Ohio.*

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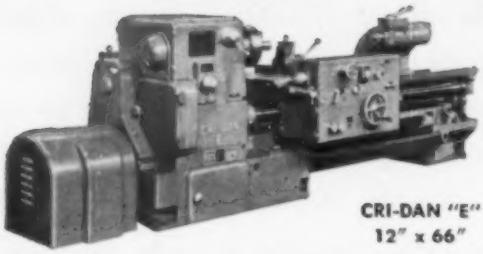
5 Positive ways Asarcon® continuous-cast bearing bronze saves you money: 1) Exact lengths. Order Asarcon 773 (SAE 660) in exact lengths you need, up to 105″. No short-end scrap as from ordinary cast bars. 2) Close-to-size. Asarcon 773 gives you only 1/32″ to 3/32″ to machine off, in diameters from 1/2″ to 9″. 3) Less machining. Less stock to remove saves machining time and cost. 4) No blow-holes, pits, or shrinks. No sand to dull tools. No hard or soft spots. No loss of machining time or parts thrown away because of metal defects. 5) Less down-time. The better, more uniform properties of Asarcon 773 assure longer life of important machine parts, and fewer breakdowns. Asarcon 773 bearing bronze is carried in 260 stock sizes, solids and tubes. See your local distributor or write Continuous-Cast Products Department, American Smelting and Refining Company, Barber, N. J.; on the West Coast, Kingwell Bros., Ltd., 457 Minna St., San Francisco; in Canada, Federated Metals Canada, Ltd., Montreal and Toronto.

CONTINUOUS-CAST DEPARTMENT OF

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

CRI-DAN *The Only PROVEN Method of Single Point Threading*

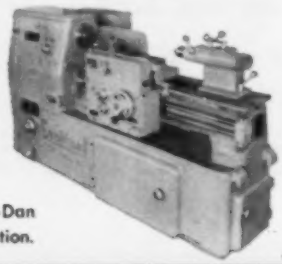


CRI-DAN "E"
12" x 66"

The newest addition to the famous line of Cri-Dan threaders, Cri-Dan "E" features hydraulically controlled clutch, brake and saddle. Spindle speed may be varied between 50 and 1400 RPM, depending upon the characteristics of the threading job. The Cri-Dan "E" is over 2,000 lbs. heavier than other machines in its line.

This single-spindle, high speed threading machine is setting new records for precision threading. Utilizing a single carbide pointed tool, the machine can be set for constant or diminishing feed per pass. Versatile, the Cri-Dan "B" handles many specialized threading jobs beyond the capacity of ordinary threaders.

CRI-DAN "B"
4" x 36"



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the LEES-BRADNER Company

CLEVELAND 11, OHIO • U.S.A.

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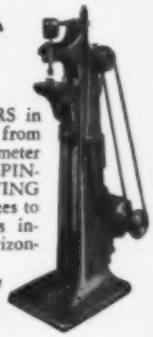

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ALL TYPE GEARS

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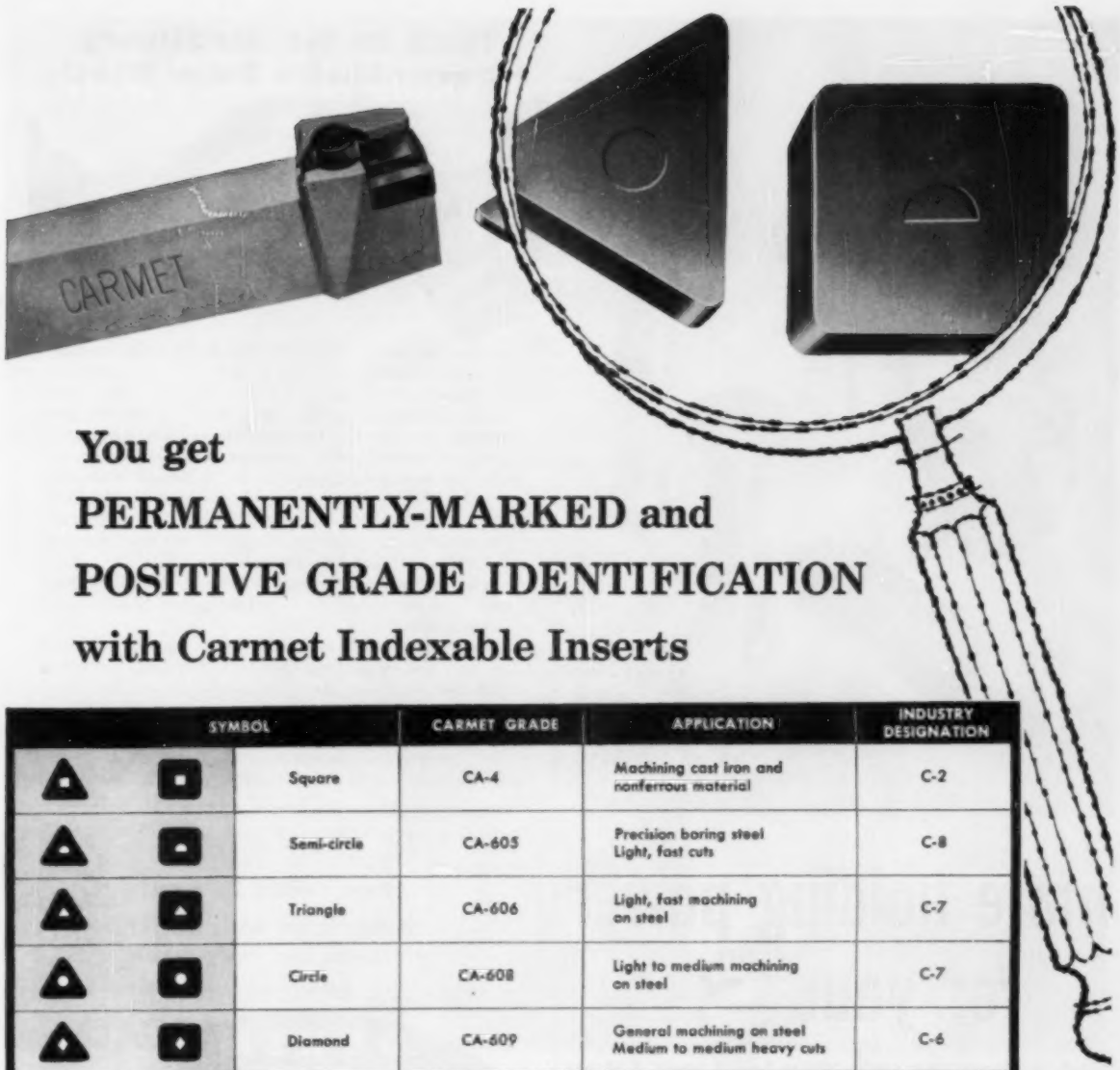

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Triangle		CA-606	Light, fast machining on steel	C-7
Circle		CA-608	Light to medium machining on steel	C-7
Diamond		CA-609	General machining on steel Medium to medium heavy cuts	C-6
Rectangle		CA-610	General machining on steel Heavy roughing cuts	C-6

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CARMET TOOL HOLDERS and INDEXABLE INSERTS

This 16-page catalog contains complete specifications for Carmet tool holders and Indexable inserts; also replacement parts for tool holders and information on choosing the proper carbide grade for the job.

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Now you can avoid the costly, confusing carbide grade mix-ups that affect production, complicate stockroom procedure and generally upset routine. A positive system of grade identification assures you the *right* Carmet blank for every job.

Each Carmet blank is permanently impressed with a symbol that tells instantly and conveniently its grade and its job application.

For all your metal-removing operations, specify the *Partners in Performance:* Carmet tool holders and Carmet tool holder inserts. There are over 115 different styles and sizes of positive and negative rake Carmet tool holders to choose from with matching inserts in six special Carmet grades . . . either utility or precision ground. Let us show you the convenience and economy of Carmet tool holders and Indexable blanks. ● *Call your nearest A-L representative or distributor, or write* ***Allegheny Ludlum Steel Corporation, Carmet Div., Detroit 20, Mich.***

WBW 6870

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Mac-it Socket Screws

more holding power for your $

When you buy screws, you're buying *holding power*. And you get more holding power per dollar with high-strength Mac-it Screws because you can use fewer and smaller screws for any given job. This means:

- **Manufacturing savings**—fewer screws to buy, fewer holes to drill, fewer holes to tap, fewer screws to assemble.
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- **Maintenance savings**—fewer screws to disassemble and reassemble, fewer screws to replace (doubly so, because Mac-it Screws last longer).

Besides this economy, another reason for specifying tough, resilient Mac-it Screws is that Mac-it Screws hold where others fail!

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Mac-it Screw Division
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Buy Mac-it Screws from your distributor:
Socket Head Cap Screws • Flat Head Socket Cap Screws • Button Head Socket Cap Screws • Socket Head Shoulder Screws • Hollow Set Screws • Hollow Lock Screws • Hex Socket Keys • Square Head Set Screws • Hex Head Cap Screws • Tool Post Screws • Square Head Collar Cap Screws • Specials

THIS is No Ordinary Power Hack Saw Blade

This is the *unbreakable* MARVEL High-Speed-Edge Hack Saw Blade—the first bi-metal blade—invented, developed and introduced by MARVEL. This blade was developed to cut any material from the free machining steels to the toughest alloys, fast, accurately and economically. Just one type blade to handle any job—no switching blades to cut different materials.

MARVEL blades can be tensioned from 200% to 300% more taut than ordinary blades. This advantage permits heavier feed pressures to be used without deflection or fear of breakage.

This rugged cutting tool assures outstanding economy, accuracy, long life and complete safety—*it is unbreakable.*

Ask for MARVEL Blades by name and you can be sure you're getting the best. Leading Industrial Distributors have them in stock. Write for latest Cutting Tool Bulletin. FB-1021

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Stops Losses making Dies and Templates

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3. More Income—Family income after taxes is at an all-time high of $5300—is expected to pass $7000 by 1975.

4. More Production—U.S. production *doubles* every 20 years. We will require millions more people to make, sell and distribute our products.

5. More Savings—Individual savings are at highest level ever—*$340 billion*—a record amount available for spending.

6. More Research—*$10 billion* spent each year will pay off in more jobs, better living, whole new industries.

7. More Needs—In the next few years we will need more than *$500 billion* worth of schools, highways, homes, durable equipment. Meeting these needs will create new opportunities for everyone.

Add them up and you have the makings of another big upswing. Wise planners, builders and buyers will act *now* to get ready for it.

FREE! Send for this new 24-page illustrated booklet, "Your Great Future in a Growing America." Every American should know these facts. Drop a post card today to: THE ADVERTISING COUNCIL, Box 10, Midtown Station, New York 18, N. Y.

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AUTOMATIC. 1⅝" 5 spdl. Warner & Swasey, 1954.
AUTOMATIC. 2" RBG Acme Gridley, 1945.
BORING MILL 9⅝" bar 2 5 Defiance, Horz., 1942
AUTOMATIC. 3" 4 spdl. Consomatic, barfeed. 1944
BORING MILL. 4" bar Universal "Tri-Way", 1000 rpm.
BROACH. 10 ton 54" stroke Amor. duplx. vrt. 1941
COMPRESSOR. 455 CFM Ingersoll Rand duplex synchr.
COMPRESSOR. 2850 CFM Worthington duplex 650 HP.
DRILL. RADIAL. 4'-9" col. Cint. Bick., super service.
DRILL, SENS. 25" MA6 Avey, No. 2 MT, 1945
GEAR HOBBER. Type A Berber Colman, 1944
GEAR SHAPER. 7125A Fellows, 1942
GEAR SHAVER. GCC Red Ring, 8", late
GRINDER, UNIV. 14"x14" Rivett Model 112, 1942
GRINDER, PLAIN. 20"x72" Landis, 1943
GRINDER, DISC. 30" No. 84A Gardner opposed, 1947
GRINDERS, INT. 72A5 Heald Univ. 1943
GRINDERS, SURF. 36" No. 10 Blanchard, 1940
GRINDER CARBIDE. Nos. 48, 49 Excello, late
LATHES. 11" and 14½" South Bend, late
LATHE. 126" x 96 ft. Niles Bement Pond.
LATHE, TURRET. No. 5 Gisholt, 1940
MILL. No. 33 Sundst. auto. "Fluidscrew", 1943
MILL. No. 2 Brown & Sharpe vert., 1943
OIL GROOVER. Wicaco continuous, 1953.
SAW. 10" x 10" Racine "Shearcut"; hack, 1941
SHAPER-PLANER. 36" Rockford univ. openside.
PRESS. 60 ton No. 6 Toledo OBI
PRESS. 90 ton No. 75 Bliss horning
PRESS. 600 ton Elmes hydraulic, 1943.

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REBUILT *and* GUARANTEED
WILL LEASE WITH OPTION TO PURCHASE, OR WILL FINANCE OVER LONG TERM
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9/10" Cleveland Model A, m.d., 1943
1-1/16" Cleveland Model D, m.d.
4 spindle 1⅝" Cleveland, Model M., m.d.
4 spindle 2" Model K Cleveland, m.d.
2½" Cleveland m.d., Model A
No. 4D Potter & Johnston, m.d., late
No. 5DELX Potter & Johnston, m.d., late
No. 5D2 Potter & Johnston, m.d.
6 spindle No. 76N Baird Chucking Machine, m.d., late
5⅝" Cleveland Model A Single Spindle, m.d., late

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅝" to 2" nuts
1½" Landis 2 spindle, m.d.
1½" Landis Bolt Threading Machine, double head stay bolt, m.d.

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No. 32 Lucas Table Type, m.d.
No. 32 Giddings & Lewis Table Type, m.d.
No. 1 Cleveland Horizontal Boring, Drilling & Milling, m.d.
4½" bar, Model 72, Niles-Bement-Pond, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Sellers Floor Type, m.d.
3½" bar Cincinnati Gilbert Horizontal, Boring, Drilling & Milling, floor type
Barrett Double End, 5" and 7" spindle, m.d.

VERTICAL BORING MILLS

18" Bullard Mult-Au-Matic, m.d.
24" Bullard Spiral Drive, m.d., 1943
30" Bullard, m.d., late, 1944
42" King, m.d., (two 1945 & 1948)
42" Bullard New Era, m.d.
44" Putnam, m.d., p.r.t.
48" Niles-Bement-Pond Car Wheel Borer, m.d.
53" Niles—Heavy Pattern, m.d., p.r.t.
53" Niles Heavy Pattern, vee belt m.d., latest, 60" under rail
60" Bullard, m.d.
84" Colburn, m.d.
102" Niles Wheel Turning Boring Mill
100" King, m.d.

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75 HP LaPointe Hydraulic Broach, m.d.
12x72" Thompson Automatic Flat Broach, m.d.
10 ton, 84" stroke LaPointe Single Ram Vertical Surface Broach, m.d., late
Type SBD-42-6 American Vertical Hy. Dup. Broach
Type SBD-48-15 American Vertical Dup. Ram Surface Hy. Broach

RADIAL DRILLS

4'-13" col. American, HOLE Wizard, m.d.
4'-13" col. Foodick, 1944
4'-15" col. Cincinnati-Bickford, m.d.
5'-15" col. Cincinnati-Bickford, Super Service, m.d.
5'-15" col. American, m.d. on arm
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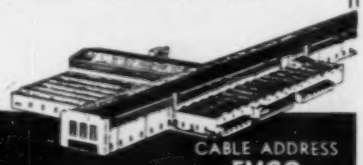

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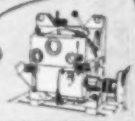

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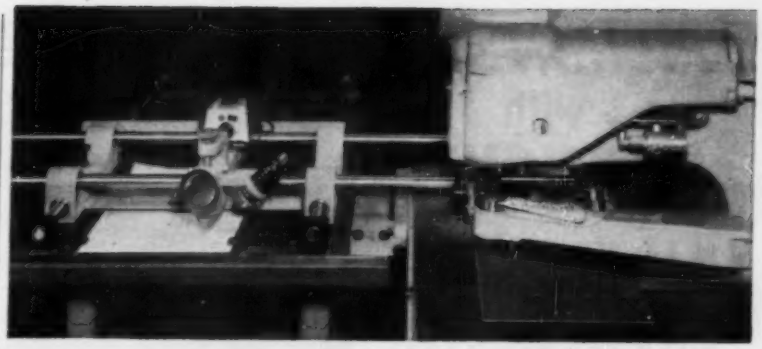

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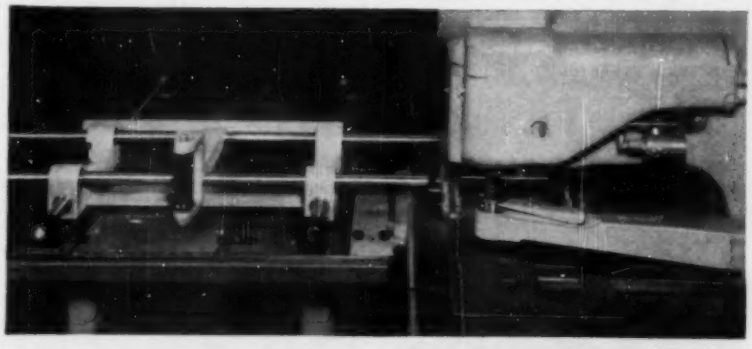

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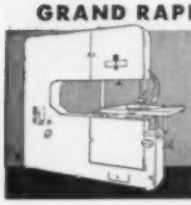

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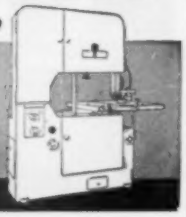

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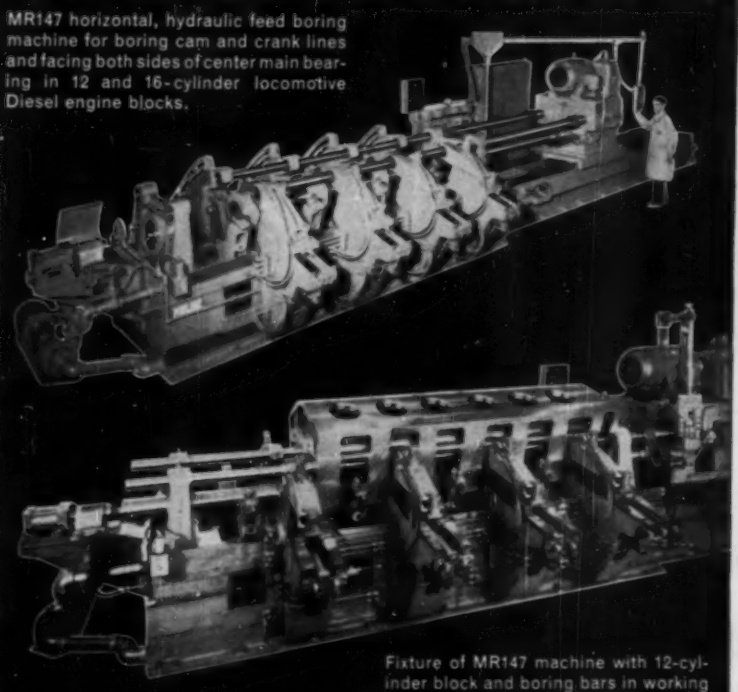

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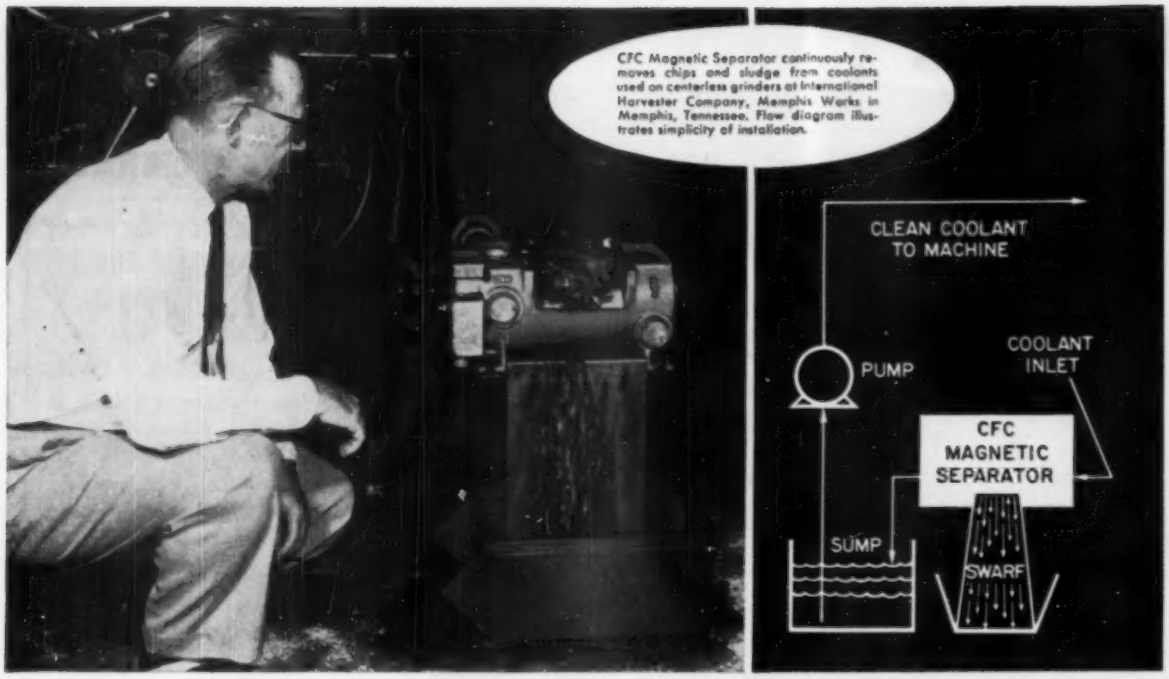
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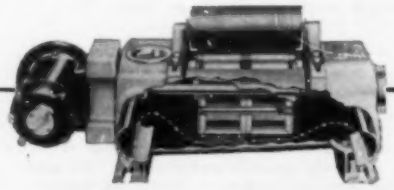

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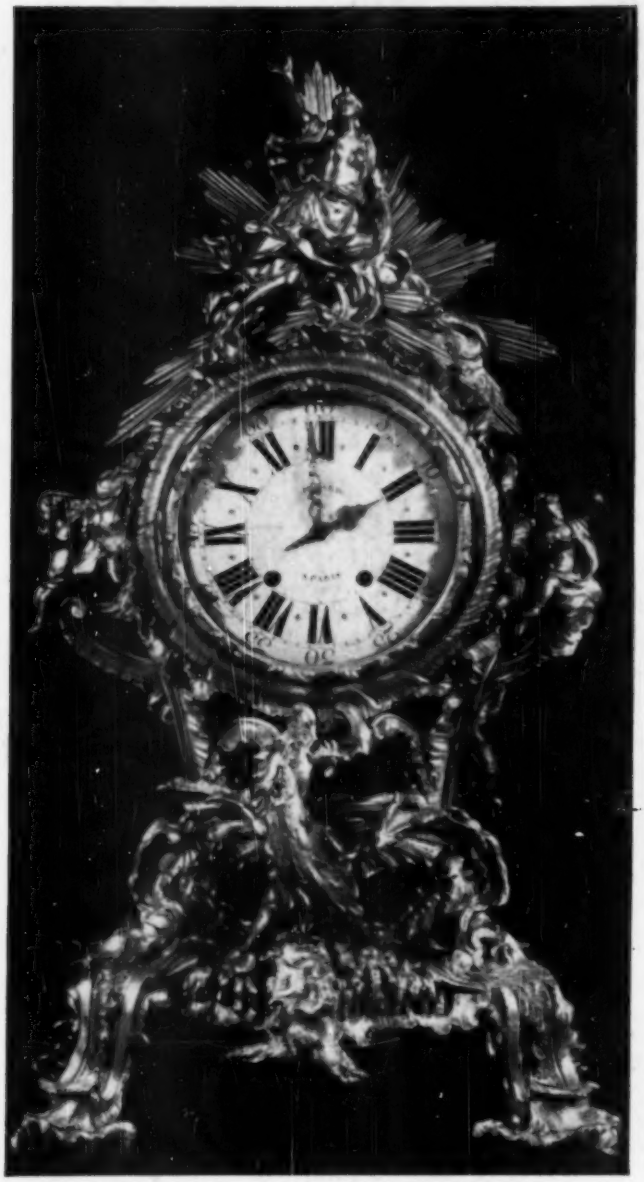

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